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MINISTRY OF PUBLIC HEALTH, EGYPT

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THE RESEARCH INSTITUTE AND THE  
ENDEMIC DISEASES HOSPITAL

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# FOURTH ANNUAL REPORT

## 1934

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CAIRO  
GOVERNMENT PRESS, BULÂQ  
1936

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EXCELLENCY,

I have the honour to submit my report on the Research Institute and the Endemic Diseases Hospital and the work done during the year 1934.

I have the honour to be,  
Excellency,  
Your obedient servant,

DR. M. KHALIL BEY,  
*Director, Research Institute.*

H. E. THE UNDER-SECRETARY OF STATE,  
DEPARTMENT OF PUBLIC HEALTH,  
MINISTRY OF THE INTERIOR,  
CAIRO.



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THE RESEARCH INSTITUTE AND THE ENDEMIC  
DISEASES HOSPITALS, CAIRO

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## FOREWORD

The present report deals with the activities of the Research Institute in the fourth year of its independent existence. The institute, however, is the direct continuation of the Ancylostomiasis and Bilharziasis Research Section of the Public Health Laboratories which was inaugurated under the present director in the end of 1922. The reports of the Research Section were published in the Annual Reports of the Public Health Laboratories, Cairo from 1923 to 1930.

During 1934 the activities of institute continued to increase. The study of what is called Egyptian Splenomegaly was inaugurated, dealing with the different aspects of the problem which remains up to the present time a subject for controversy as regards its aetiology. Special attention was devoted to the chemical composition of the spleen and the chemical changes in the blood.

In view of the recent introduction of perennial irrigation in isolated areas in Aswan and Qena Provinces, a preliminary survey was carried out to assess the degree of infection with Helminths. After several years the same places will be resurveyed to establish the effect of this system of irrigation on Helminthic infection.

The activities of the Entomology Section has very much increased and the problem of Malaria and mosquitoes in general receive the greatest consideration.

The methods of examination and treatment of Parasitic infection are continually under investigation to perfect them as much as possible.

A new feature which may become serious in future is the increasing popularity of the Institute as a place where diagnosis of obscure cases is done. The number of cases referred to the Institute for diagnosis or treatment is continuously increasing.

In addition, many individuals in high rank in society or amongst officials of the Government seek to be examined and treated. The effect of this will be interference with the researches carried out by the Institute. It is, however, sometimes very difficult to refuse cases in which the methods followed in the Institute offer the only chance for clearing up their condition.

*August 1935*

M. KHALIL



MINISTRY OF PUBLIC HEALTH, EGYPT

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The Research Institute and the Endemic  
Diseases Hospital

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Fourth Annual Report, 1934

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PART 1

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SECTION I.—Biochemical Section

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1.—A STUDY ON THE EXTRACT OF THE MALE FERN  
(EXTRACTUM FILICIS)

It has lately been observed that the extracts of male fern used in the Institute were ineffective in the expulsion of *Taenia*. Patients suffering from this worm infection passed only short segments or none at all when given the extract in the proper dose. These extracts were obtained from the Stores of the Department of Public Health and were prepared abroad.

Analysis of the extracts showed that they conformed with the requirements of the B.P. (1932) and contained from 24 to 26 per cent Filicin as determined by the official method. From this it was concluded that the extracts had possibly lost their activity through long storage. No definite information could be obtained as regards the length of time these extracts were kept in the Stores of the Public Health Department.

A fresh extract was then prepared from the rhizome, a supply of which was obtained from Switzerland through the courtesy of the Royal Egyptian Legation at Berne. The rhizomes were collected late in autumn and were sent to the Institute immediately after their collection. A liquid extract was then prepared from them according to the directions of the B.P. 1932. Analysis of this extract showed that it contained 36 per cent Filicin.

*Toxicity.*

The toxicity of this fresh extract and of one of the old extracts were tested on rabbits and white rats.



1. Rabbits :

(a) Fresh extract containing 36 per cent Filicin given orally; M.L.D.= 1.5 c.c. for rabbits of 1,600 grammes ( $\pm$  100 grammes).

(b) Old extract, 24 per cent Filicin: M.L.D.= 2 c.c. for rabbits of 1,600 grammes ( $\pm$  100 grammes).

Further animal experiments showed that the toxicity of the extracts when given orally to rabbits is proportional to the amount of Filicin they contain.

2. White rats :

It was also found that the toxicity of the extracts could be determined if they were injected intramuscularly into rats. Again it was established that the toxicity of the extract is proportional to the amount of Filicin it contains.

(a) Given intramuscular injections of fresh extract containing 36 per cent Filicin: M.L.D.= 0.1 c.c. for rats of 180 grammes ( $\pm$  20 grammes).

(b) Given intramuscular injections of old extract containing 24 per cent Filicin: M.L.D.= 0.2 c.c. for rats of 180 grammes ( $\pm$  20 grammes).

*Treatment of Patients.*

The fresh extract was given to patients with *Taenia* infections. The strength of this extract was not adjusted by the addition of olive oil as recommended by the B.P., but was used undiluted. Instead of the dilution of the extract, the dose was reduced according to the increase of the percentage of Filicin it contained. Thus, instead of giving the usual 5 c.c. for an adult of 60 kilos. 3.5 c.c. of the fresh extract were given as the maximum dose.

The extract was very effective in *Taenia* infections, the entire worm was expelled following the administration of the extract in most of the patients. The extract was also very active in *Heterophyes* infections. Except for slight nausea no toxic symptoms developed after its administration.

This investigation suggests the importance of using fresh extracts and shows definitely that the extracts deteriorate by long storage.

It would be very useful if the different manufacturing chemists labelled their extracts with the dates of their preparation.

Apparently, up to the present time, no chemical method is available to detect whether extracts are fresh or old. This can only be ascertained by testing the anthelmintic activity of the extract.



## II.—TRYPAFLAVINE (ACRIFLAVINE)

Trypaflavine has been tried in the Institute for the treatment of schistosomiasis. The results obtained are given in detail in the clinical report.

Three preparations were used :—

- (1) Bayer Trypaflavine 3·6 diamino – 10 methyl acridine chloride.
- (2) Boot's 2 : 8 : Diamino – 10 methyl acradinum chloride hydrochloride.
- (3) May and Baker Diamino–methyl acridine.

Trypaflavine is a dye originally introduced by Benda in Germany in 1912 against trypanosomes as the name implies. It is manufactured in England under the name of acriflavine. Its hydrochloride is now introduced in the British Pharmacopoea (1933) under the name of "Acriflavina," and is described as the hydrochloride of 2 : 8 diamino–10 methyl – acridinum chloride  $C_{14} H_{14} N_3 C HCl$ , Mol. Wt.=296·1.

As the diamino-methyl acridine supplied by May and Baker, according to the formula written on the label was not supposed to contain chlorine, while on analysis it was found to be present, the chlorine content of the above three preparations was estimated by the following method :

0·3 gramme of the substance is dissolved in 80 c.c. distilled water and a solution containing 20 grammes of pure sodium persulphate in 20 c.c. caustic soda solution, sp. gr. 1·33 is added. The mixture is then diluted to 300 c.c. with distilled water, 5 grammes of pure sodium sulphate are added and then the whole is heated for 15 minutes on the water-bath to destroy the excess of persulphate. Nitric acid is added in excess and a sufficient amount of  $AgNO_3$ . The silver chloride is allowed to settle, washed, dried and weighed in the usual way.

Results of analysis :—

### (1) *Bayer preparation*

Cl found =13·48 per cent.

Calculated for pure  $C_{14} H_{14} N_3 Cl$ .

Cl=13·68 per cent.

### (2) *Boot's preparation*

Cl found =23·73 per cent.

Calculated for pure  $C_{14} H_{14} N_3 Cl H Cl$

Cl =23·98 per cent.

(3) *May and Baker preparation*

Cl found = 23.35 per cent.

It appears from these estimations as well as from other physical and chemical characters that the May and Baker preparation is the chloride hydrochloride and should have been labelled diamino-methyl acridine chloride hydrochloride.

*Solubility.*

Boot's and May & Baker's preparations are freely soluble in water, while the Bayer preparation (which is the neutral chloride) is less soluble.

The question of the solubility of acriflavine has been investigated lately in detail by M. Gailliot who observed that in the preparation of acriflavine the product obtained of the purification never contains the theoretical percentage of methyl radical ( $\text{CH}_3$ ). He was led to the conclusion that the methylation was incomplete and that the final supposedly pure products were always contaminated with proportions of diamino-acridine HCl. He has shown that the acriflavine B.P. is not, as described, the HCl of 2.8 diamino - 10 methyl acridinum chloride but consists of a mixture of this compound with approximately an equal quantity of diamino-acridine HCl.

These questions were also studied by Marshall and Hall and by Powell who came to similar conclusions.

In this investigation no attempt was made to estimate the percentage of methylated and unmethylated compounds in the three preparations which were used in the Institute, as the amounts of the drug which were given to the patients were enormous (in one case 6.8 grammes were given) and yet not a single cure was obtained (*see clinical report*).

III.— THE TOXICITY OF CARBON TETRACHLORIDE  $\text{C.Cl}_4$

This question was further investigated in collaboration with the section of experimental pathology and medicine.

*Poisoning.*

No cases of poisoning from  $\text{C.Cl}_4$  occurred in the Institute during 1934. The  $\text{C.Cl}_4$  used is always submitted to a thorough chemical analysis, and it is also redistilled before use.

A case of poisoning from  $\text{C.Cl}_4$  was reported to the Institute from another hospital.

*Case No I.*—Patient Ahmed Mohamed Selim, male, aged 7 years, weight 22 kilos, from Mit Abu-Khalid near Mit Ghamr.

Urine: negative for ova.

Stools: *Ascaris* ova +.



Patient had a saline purge on the evening of September 11, 1934. On the following morning he received 1 c.e. of a mixture of  $\text{CCl}_4$  and oil of chenopodium in equal parts at the Mit Abu-Khalid An-clystoma Hospital. The  $\text{CCl}_4$  and oil of Chenopodium mixture was followed by the usual magnesium sulphate purge. Bowels moved and the patient passed some Ascaris worms.

On the 13th, the patient felt unwell and could not go to his work and passed some Ascaris worms. On the 14th, he started to vomit any fluid or food taken by mouth and was seen in the evening by a doctor who gave him a soap enema.

On the 15th, vomiting was still persisting and colic and abdominal pains started.

On the 16th, the patient was removed to Mit-Ghamr Hospital in a semi-conscious condition.

#### Report of Mit-Ghamr Hospital :

Patient admitted on September 16, 1934 at 9.30 a.m. deeply comatosed, pupils slightly dilated, reacting to light. Reflexes + +. Pulse 110. Temperature  $37.2^\circ \text{C}$ .

Heart : normal. Liver : enlarged, 2-finger breadths, and tender. Abdomen : lax. Chest : normal.

Spleen : not felt.

Urine : Reaction : acid. Sp. gr. : 1,008.

Albumin : + +. Glucose : nil.

Microscopical examination : R.B.C. +. No casts.

Stools : Ascaris ova.

Treatment on September 16, 1934 :

Calcium Sandoz, 30 c.c. intravenously.

Stomach wash with magnesium sulphate, 40 c.c. left in the stomach.

Pituitrin, intramuscularly.

Camphor injection every 3 hours.

Strychnine injections 0.5 c.c. every 8 hours.

The patient was then given :

20 c.c. calcium Sandoz intravenously

10 c.c. calcium Sandoz after 4 hours later intravenously.

10 c.c. calcium Sandoz after another 4 hours intravenously.

On the 17th :

Soap enema.

Camphor injection every 3 hours.

10 c.c. calcium Sandoz intravenously.

Saline 250 c.c. subcutaneously.

At 9.30 a.m. on the 17th the patient was examined by a doctor sent from the Research Institute.

*Report :*

Patient unconscious, irritated by any manipulation. Respiration 30, pulse 120, temperature 38.2° C. Heart : systolic pulmonary murmur. Chest, clear ; liver two-finger breadths enlarged and tender ; spleen not felt ; abdomen lax ; pupils not dilated and react slightly. Reflexes : knee jerks +, abdominal +, Babiniski +.

Samples of blood and urine were taken and sent to the Research Institute.

Report on the urine and blood taken from the patient on September 17, 1934 :

Urine : (Few c.c. were obtained by the catheter) as the patient passed urine before the arrival of the doctor.

Albumin : 0.25 gramme per litre.

Glucose : nil. Acetone bodies : nil. Bile pigment : +.

Urobilinogen +. Microscopical examination : abundant R.B.Cs, few pus cells, no casts.

*Blood :*

Glucose, 55 mgrms. per 100 c.c.

Urea, 90 mgrms. per 100 c.c.

Uric acid, 13.3 mgrms. per 100 c.c.

Calcium, 9 mgrms. per 100 c.c.

Icterus Index, 25.

Van den Bergh : biphasic.

The patient died on the 18th at 4 p.m. and a doctor from the Institute was sent to attend the post-mortem examination.

The post-mortem was done on the 19th at 4 p.m. Two living *Ascaris* worms were coming out through the right nose, signs of putrefaction were seen on abdomen, lividity on the back of the body.

Sclera were slightly tinged. Abdomen : viscera in normal position, no kinking or any abnormality could be found by inspection or palpation.

Stomach was full of *Ascaris* worms, about 40 in number, all were dead.

No inflammation or ulceration of the walls. The duodenum was found normal, no *Ancylostoma* worms were found.

The ileum just before the caecum (10 inches) was dark in colour and not distended as other parts of the intestine. When opened, it was found to be full of clumps of *Ascaris*, some of them were aggregated and definite partial obstruction was seen. When all the worms were cleared, the lumen of this part was congested and petechial haemorrhages were seen. The caecum was full of stools of greenish colour.



No other abnormality could be seen in the intestines. The liver was slightly enlarged and fatty. The spleen was normal in size. The kidney capsule easily taken off, and no signs of nephritis.

Histological studies of this case will be reported in the clinical and pathological section.

### *Experimental Work.*

Owing to a suggestion made by Lambert that heavy *Ascaris* infection predisposes to poisoning by  $\text{CCl}_4$  by lowering the blood calcium, the blood calcium was estimated in 7 cases of pure heavy *Ascaris* infection.

The blood serum calcium was normal 9–11 mgrms. per 100 c.c.

Further, 21 lactating women whose blood calcium was found to range from 8 to 9.5 mgrms. (slightly reduced or below normal) were given  $\text{CCl}_4$  with no ill effects.

### *Animal Experiments.*

The poisoning from  $\text{CCl}_4$  following the administration of the drug to patients with heavy *Ascaris* infection was attributed by some workers to the action of  $\text{CCl}_4$  on the *Ascaris* worms, dissolving a toxic substance from them which is responsible for the poisoning. To investigate this, the following experiments were carried out:

1. Forty grms. of fresh human *Ascaris* worms were cut up into small pieces, put in cylinder and 100 c.c. of  $\text{CCl}_4$  were added. The cylinder was stoppered and put in the shaking machine for 4 hours. The contents of the cylinder were then filtered through ordinary filter paper and the  $\text{CCl}_4$  extract was administered to dogs in doses of 5 c.c. p.k.w. The animals showed no toxic symptoms.

2. Fresh human *Ascaris* worms were washed with tap water and quickly dried between filter papers. They were then spread on glass plates and dried in vacuum desiccators at room temperature.

The dried worms were powdered and 15 grms. of the powder were extracted with 100 c.c.  $\text{CCl}_4$  in Soxhlet apparatus for 24 hours. The  $\text{CCl}_4$  extract was given to dogs in doses of 5 c.c. p.k.w. The animals did not show any toxic symptoms.

These experiments, evidently, do not support the above view.

Further experiments bearing on the toxicity of  $\text{CCl}_4$  are being carried out.

## IV.— THE SERUM PROTEINS IN HUMAN SCHISTOSOMIASIS

The changes in the serum proteins in patients with pure *Schistosoma* infection were studied.

Two groups of patients were selected:—

*Group I.*—Comprised patients with *Schistosoma* infection and normal livers and spleens.

*Group II.*—Comprised patients with *Schistosoma* infection and enlarged spleens, *i.e.* Egyptian splenomegaly cases.

The object of this work was to study the changes in the serum proteins in *Schistosoma* infection and to follow any changes in these, following the administration of antimony for treatment:

*Group I.*—The serum of 10 patients was investigated. Results are shown in tables I and 2. Unfortunately, none of these patients completed the course of treatment, all being from the out-patients. From tables I and 2, it can be seen that :

In patients with *Schistosoma* infection only, with normal livers and spleens :

- (1) The blood fibrinogen is normal.
- (2) Total serum proteins slightly higher than normal.
- (3) The albumin is reduced while the total globulin is increased hence, the globulin albumin ratio is increased.
- (4) The proportion of euglobulin to total globulin is only slightly increased.

*Group II.*—Egyptian splenomegaly cases with *Schistosoma* infection only : The serum of 6 patients was investigated. Results are shown in tables 3 and 4. It can be seen from these tables that :

- (1) Total serum proteins are slightly increased.
- (2) The albumin is reduced while the total globulin is increased ; hence, the globulin albumin ratio is increased.
- (3) The proportion of euglobulin to total globulin is greatly increased.

Thus, it appears that the most characteristic feature in the Egyptian splenomegaly cases is the great increase of the euglobulin fraction.

In *Bilharzia* patients with normal spleens, the euglobulin fraction is normal or only slightly increased.



TABLE 1.—CASES WITH BILHARZIA INFECTION ONLY  
Results are given in Grammes of Nitrogen per 100 c.c. Serum

Case No.	Urine	Faeces	Spleen	Liver	Serum Total Nitrogen	Serum Proteins Nitrogen	Serum non- protein N	Albumin N	Globulin N	Euglobulin N	Pseudo- globulin N
1	— ... ...	Sch. haem. ova	—	—	1.03	1.262	0.038	0.751	0.511	0.05	0.461
2	Sch. haem. ova ...	—	—	—	1.27	1.231	0.039	0.788	0.443	0.08	0.363
3	Blood and pus ...	Sch. haem. ova	—	+	1.33	1.028	0.044	0.548	0.738	0.01	0.638
4	Sch. haem. ova ...	—	—	—	1.33	1.028	0.048	0.597	0.683	0.07	0.613
5	Sch. haem. ova ...	Sch. mans. ova	—	—	1.31	1.278	0.033	0.532	0.748	0.14	0.608
6	— ... ...	Sch. mans. ova	—	—	1.33	1.277	0.043	0.588	0.689	0.06	0.629
7	Sch. haem. ova ...	—	—	—	1.39	1.034	0.005	0.068	0.066	0.07	0.059
8	Sch. haem. ova ...	—	—	—	1.31	1.279	0.031	0.729	0.055	0.07	0.048
9	Sch. haem. ova ...	—	—	—	1.04	1.359	0.041	0.079	0.569	0.08	0.489
10	Sch. haem. ova ...	Sch. mans. ova	—	—	1.22	1.183	0.039	0.612	0.571	0.09	0.481

Haem = Schistosoma haematobium.  
Mans = " Manson.  
N = Nitrogen.

TABLE 2.—CASES WITH BILHARZIA INFECTION ONLY

*Results are expressed in Grammes per 100 c.c. Serum*

Case No.	Total Proteins	Fibrinogen	Albumin	Globulin	Euglobulin	Globulin Albumin Ratio	Per cent Euglobulin in Total Globulin
1	7.88	0.21	4.69	3.19	0.31	0.68	9.71
2	7.69	0.61	4.93	2.77	0.05	0.56	18.05
3	8.00	0.43	3.43	4.06	0.63	1.34	13.58
4	8.00	0.53	3.73	4.27	0.44	1.14	10.03
5	7.99	0.74	3.33	4.68	0.88	1.04	18.71
6	7.98	0.91	3.68	3.68	0.38	1.01	10.19
7	8.94	0.59	4.25	4.13	0.44	0.97	10.09
8	7.99	0.27	4.55	3.44	0.44	0.75	12.79
9	8.49	0.71	4.94	3.55	0.05	0.718	14.08
10	7.39	0.57	3.83	3.57	0.56	0.93	15.68

TABLE 3.—EGYPTIAN SPLENOMEGALY CASES

*Results are given in Grammes of Nitrogen per 100 c.c. Serum*

Case No.	Urines	Faeces	Spleen	Liver	Serum Total Nitrogen	Serum Total Protein N	Serum Non- Protein N	Albumin N	Globulin N	Euglobulin N	Psuedo- globulin N
1	—	—	++++	++	1.02	1.16	0.04	0.68	0.48	0.09	0.39
2	—	—	++++	++	1.45	1.398	0.053	0.566	0.832	0.19	0.642
3	—	—	++++	++++	0.784	0.752	0.032	0.443	0.309	0.08	0.269
4	—	—	++++	++	1.28	1.258	0.022	0.562	0.596	0.14	0.456
5	—	—	++++	++	1.38	1.33	0.05	0.57	0.76	0.18	0.62
6	—	—	++++	++	1.48	1.43	0.05	0.37	0.06	0.36	0.50



TABLE 4.—EGYPTIAN SPLENOMEGALY CASES

*Results are expressed in Grammes per 100 c.c. Serum*

Case No.	Total Proteins	Albumin	Globulin	Euglobulin	Globulin Albumin Ratio	Per cent Euglobulin in Total Globulin
1	7.25	4.25	3.00	0.56	0.07	18.75
2	8.74	3.44	5.02	1.19	1.45	22.82
3	4.76	2.77	1.93	0.05	0.69	38.06
4	7.86	3.51	3.73	0.88	1.06	23.48
5	8.71	3.56	4.19	1.13	1.17	26.86
6	8.94	2.31	6.63	2.25	2.86	34.00

## V.—THE CHEMICAL COMPOSITION OF THE SPLEEN IN EGYPTIAN SPLENOMEGALY

### *A.—Preliminary Report*

The present work is confined to the investigation of the chemical composition of the spleen in Egyptian splenomegaly. No previous work has been done as regards the chemical composition of such spleens except for the demonstration of the haemosiderin nature of the so-called “Fibrosiderotic Nodules” found in a certain number of such spleens.

#### *Material.*

*Egyptian Splenomegaly Cases.*—The spleens were obtained from the Qasr el-Aini Hospital and were received in the Laboratory within half an hour of their removal from the patients.

The spleens were squeezed to free them as far as possible from blood and then weighed. They were cut up into slices and washed with saline and then with distilled water till they were practically free from haemoglobin, as it was impossible to get them completely free.

The slices were dried quickly between filter papers and then passed through a mincing machine.

### *Controls.*

Four normal spleens were obtained from the Medico-Legal Department. They were subjected to the same chemical analysis.

### *Methods.*

The following estimations were carried out :

Moisture — Total Nitrogen — Glycogen — Total Fat (Crude)—  
Total Fatty Acids — Cholesterol — Phosphorus — Ash — Iron —  
Calcium.

(1) Moisture: The material is dried at 100° C. until it is of constant weight.

(2) Total Nitrogen: The macro-Kjeldahl method is used. The results are expressed as grammes of nitrogen per 100 grammes of wet weight of tissue.

(3) Glycogen: Pflüger's method as modified by Cori & Cori is used. Results are expressed in grammes of glycogen per 100 grammes of wet weight of tissue. Results obtained for glycogen are undoubtedly low owing to the different factors promoting glycogen lysis, *e.g.* the preparation of the patient before the operation, the effect of anaesthesia, the method of the preparation of the material before analysis, etc.

(4) Total Fat, " crude," Total Fatty Acids, Cholesterol and Phosphatides: For this group Bloor's methods are used. The tissue is extracted with Bloor's alcohol-ether mixture and the results are expressed in grammes of the substance per 100 grammes of wet weight of tissue.

(5) Ash, phosphorus, Iron & Calcium: These are determined in the tissue after it has been dried at 100° C. to constant weight. The dried material is pulverized in a glass mortar and then used for the above determinations.

The ash is determined according to the method of " Official and Tentative Methods of the Association of Official and Agricultural Chemists. " Results are expressed as grammes of ash per 100 grammes of dry weight of tissue.

Phosphorus: is determined according to the above official methods. Results are expressed as grammes of  $P_2$  per 100 grammes of the dried tissue.

Iron and Calcium: The dried tissue is ashed in a platinum crucible in a regulated electric furnace. The calcium is estimated



according to the "official methods," and the iron according to the Elvehjen-Kennedy method. Results are expressed as grammes of calcium as (Ca) and the iron as (Fe) per 100 grammes of the dried tissue.

### *Splenomegaly Spleens.*

In the first 9 spleens which were used for analysis none showed any fibrosiderotic nodules by naked eye examination. Sections were made from these spleens and a report on these will be made by the Clinical Pathology Section.

A look-out for spleens with such nodules was kept for some time. Four such spleens were found among 50 examined. The nodules have a characteristic orange colour. If they are touched with a drop of strong HCl followed by a drop of potassium ferrocyanide, an intensive Prussian blue colour appears. The number of such nodules in 2 out of the above 4 spleens was only small. Thus, in one case the whole spleen was cut up into thin slices and only about 20 nodules were found.

These fibrosiderotic nodules were dissected from the tissues, treated with strong HCl, centrifuged and the clear fluid used in the following tests :—

- (1) Na OH gave a brown ppt. of  $\text{Fe}(\text{OH})_3$ .
- (2)  $\text{K}_4 \text{Fe}(\text{CN})_6$ , a heavy blue ppt. of ferric ferrocyanide.
- (3) K CN S gave the characteristic deep red colour soluble in amyl alcohol.
- (4)  $(\text{NH}_4)_2 \text{S}$  a heavy black ppt.

The above four tests all show the typical reactions of ferric iron, hence the concentrated HCl extract of the fibrosiderotic nodules contains iron in a simple ionic form.

Some of the fibrosiderotic nodules were dissected from the tissue dried at  $100^\circ \text{C}$ . till they became of constant weight and then the iron content was estimated in the usual way. They were found to contain 1.4 per cent of iron calculated as Fe.

Results of analysis of the spleens from Egyptian splenomegaly cases will be given in detail later as the work is still going on.

## VI.—FASCIOLA GIGANTICA, AN ANTIGEN FOR THE SKIN REACTION IN HUMAN SCHISTOSOMIASIS

In carrying out the intradermal test in bilharziasis using *Schistosoma bovis* as an antigen, a second extract prepared from *Fasciola gigantica* worms was used as a control test. It was observed that this second extract gave also a positive reaction in 25 per cent of

the Bilharzia patients. At the same time, all patients who gave a negative reaction with the *Sch. bovis* extract were also negative with the *Fasciola gigantica* extract.

An attempt was made to prepare an extract from *Fasciola gigantica* worms, which would give a higher number of positive intradermal reactions with Bilharzia patients. This was achieved by extracting the dried and powdered worms with lipoidal solvents, which do not destroy the antigenic properties of the worms.

It was established that an extract from *Fasciola gigantica* worms (prepared by special technique) could be used in the intradermal test in human schistosomiasis.

(Published in the Journal of the Egyptian Medical Association, Vol, XVIII, No. 12, 1934),

## SECTION II.—Experimental Pathology and Medicine

Problems completed or started during the year 1934 will be enumerated. Detailed results are to be found in the clinical report and in the special publications referred to.

### I.—STUDIES ON ANAEMIAS IN EGYPT

#### (a) *Treatment of helminthic anaemias ;*

The following methods were tried :—

- (i) Copper in the form of 1 per cent copper sulphate solution, 10 – 20 drops t.d.s.
- (ii) Arsenic : The effect of arsenic on blood regeneration was investigated in white rats kept on standard diet, so that their reticulocytes remained constant all through, ranging from 7 to 10 per cent. Sodium cacodylate was administered subcutaneously to 20 white rats. The injections were given daily for one or two weeks and the reticulocytic counts were followed. Marked reduction in the number of reticulocytes was found in 14 cases. To exclude latent Bartonella infections, these 14 rats were splenectomised ; 5 of them showed positive Bartonella. This experiment shows that arsenic acts as a depressor of the bone-marrow with a decrease in the production of reticulocytes.

Sodium cacodylate administered subcutaneously in 11 cases of helminthic anaemia, showed no haemopoietic action (see clinical report).

- (iii) Vitamines in the form of Marmite and vitamine C.
  - (iv) Blood injections were given in 6 cases of helminthic anaemia.
- For results obtained by these methods, see clinical report.



(b) *Studies on the Mechanism of Ancylostoma-anaemia.*

In addition to the observations on human cases, experiments on dogs were carried out to decide on the role of the nutritional factor in predisposing to the development of *Ancylostoma-anaemia*.

Similar degrees of infection were produced in two batches of dogs, one of them on poor, and the other on rich diet. The anaemia developed quicker and more severely in the former (values of 40 per cent Hb. were found after 5 months) while in the latter, the maximum reduction of Hb. at the end of this period was 25 per cent.

This experiment supports the significance of food deficiency in contributing to the development and rapid progress of this anaemia.

## II.—HEPATOSPLENOMEGALY

(a) On account of the presence of many similar conditions in Egypt (enumerated in the previous report), a *special scheme* has been suggested for the investigation of hepatosplenomegaly. This scheme, carried out in the Institute, has accomplished the separation of these conditions, although not completely (see clinical report).

(b) *Relation to bilharziasis.*—See clinical report.

(c) *Liver function tests in hepatosplenomegaly.*—The following tests were carried out :—

- (i) Icterus-index was estimated in 87 cases.
- (ii) Urobilinogen „ „ „ 87 „
- (iii) Galactose tolerance test (blood-sugar curve and galactose in urine) was carried out in 36 cases.
- (iv) Takata-Ara reaction was made in 20 cases of endemic hepatosplenomegaly and in 6 cases of chronic malarial hepatosplenomegaly.

The results obtained by these tests are given in detail in the clinical report.

(d) *Uric acid metabolism in hepatosplenomegaly.*—A case was reported (Proceedings of the Clinical Society of Qasr el-Aini Hospital) in which very high blood uric acid returned to normal after splenectomy. The blood uric acid was studied in 6 more cases of this condition (in collaboration with the Biochemical Section).

Results will be published when sufficient data are available.

(e) *Hepatolienography* by thorotrast was carried out in 16 cases up till now. The following points are commented upon in the clinical report :—

- (i) Nature of the splenic shadow.
- (ii) Condition of the liver.

In addition, the histology of spleens removed after thorotrast injections as well as the effect of splenectomy on the organism are under investigation.

(f) *Splenectomy* has been performed in 51 chosen cases of bilharzial cirrhosis with splenomegaly up to the present time.

The following questions are under investigation :—

- (1) Effect of splenectomy on the blood picture.
- (2) Effect of splenectomy on liver function.
- (3) Examination of removed spleens :—
  - (i) For incidence of fibro-siderotic nodules.
  - (ii) For presence of *Bilharzia* ova.
  - (iii) Smears for presence of *Leishmania* bodies and malaria.
  - (iv) Histology.

Some results of these investigations are found in the clinical report, others will be published when sufficient data are available.

(g) *Effect of adrenalin injections* in this disease was studied.

The following points were observed :—

- (i) Effect on the size of the enlarged spleen : This is of diagnostic value and also allows one to judge on the contractile power of the diseased organ.
- (ii) Shrinkage, when associated with pain, suggests the presence of perisplenic adhesions. This procedure may, therefore, be utilised before surgical interference.
- (iii) Changes in the blood picture following adrenalin injections have been suggested as aiding in the study of the nature of splenic enlargement. Details of these changes in the endemic form and other similar conditions as well as in splenectomised cases, will be published later.

### III.—FILARIASIS

The effects of biochemical changes in the blood on the micro-filarial counts were studied in 3 cases with filariasis associated with diabetes, jaundice and malaria respectively. In addition, the effect of ketosis, produced experimentally by ketogenic diet, in a filariasis patient was also studied (see clinical report). The findings obtained suggest further investigations.



#### IV.—LEISHMANIASIS

(a) *Treatment of Oriental Sore.*—Three additional methods of treatment were tried during the year:—

- (i) Berberine sulphate solution, injected locally, was tried in 8 cases positive for Leishmania bodies.
- (ii) Solganol injections, intramuscularly, were tried in one case with multiple nodules positive for Leishmania bodies.
- (iii) Trypaflavine, intravenously, was tried in one case. For results see clinical report.

(b) *Search for Visceral Leishmaniasis:*—

- (i) 50 cases of hepatosplenomegaly were studied in Alexandria.
- (ii) Three cases of hepatosplenomegaly in adults coming from the Sudan were investigated in the Institute.
- (iii) Smears from 51 spleens removed by operation were examined for Leishmania bodies.
- (iiii) Smears from spleens and bone-marrow of 400 dogs were examined for Leishmania bodies.

For results see clinical report.

(c) *Method for obtaining bone-marrow by sternal puncture.*—A method was devised for this procedure. A needle was constructed locally from discarded lumbar-puncture needles. Description of apparatus and technique of the method are published in the "Journal of the Egyptian Medical Association," Vol. XVII, Oct. 1934.

This method has been used in looking for visceral leishmaniasis in preference to splenic puncture. Moreover, material was obtained from cases of bilharzial cirrhosis with splenomegaly and of ancylostoma anaemia cases. Results of these studies will be published later.

#### V.—MALARIA

(a) *Criteria for the diagnosis of chronic malarial hepatosplenomegaly.*—A study of 40 cases was carried out in Fayoum. Certain points could be obtained to differentiate these cases from bilharzial cirrhosis with splenomegaly (see clinical report).

(b) *Black-water Fever*.—Two cases of haemolysis in benign tertian malaria under plasmochin treatment are reported (see clinical report). Whether these cases are genuine black-water fever or related to toxic Plasmochin action could not be decided.

(c) *Inoculation Malaria*.—12 cases of nervous syphilis were inoculated intravenously with malarial blood. Parasitological, haematological and biochemical studies were undertaken. Results will be published later.

VI.—SCHISTOSOMIASIS

(a) *Bilharzial liver*.—Studies on liver function in various stages of liver bilharziasis were carried out (see clinical report).

(b) *Bilharzial Haemospermia*.— 7 cases of bilharziasis of the seminal vesicles were collected. The cystoscopical picture is described in 3 cases (see clinical report and publication).

(c) *Treatment of Bilharziasis by Acridine Compounds*.—Various acridine preparations were administered to 81 cases of bilharziasis with negative results. Details of this work can be seen in a publication and in the clinical report.

SECTION III.—Protozoology and Helminthology

I.—INTESTINAL PROTOZOAL INFECTION AMONG THE INMATES OF A HOSPITAL FOR CHILDREN

Fresh faeces from 170 cases were sent for examination in the Institute. This was carried out immediately after the arrival of the specimens. The results were as follows :—

Infection	Number	Percentage
Total number examined ... ..	170	—
<i>E. histolytica</i> ... ..	2	1·17
<i>E. coli</i> ... ..	12	7·00
<i>E. nana</i> ... ..	4	2·35
<i>I. bütschlii</i> ... ..	—	—
<i>Lamblia</i> ... ..	23	19·4
<i>Chilomastix</i> ... ..	8	4·7
<i>Trichomonas</i> ... ..	5	2·94
Other flagellates ... ..	—	—



Distribution of infection according to age was as follows :—

Infection	Children less than 2 Years	Children from 2 to 10 Years
Number examined ... ..	67	103
<i>E. histolytica</i> ... ..	1	1
<i>E. coli</i> ... ..	—	12
<i>E. nana</i> ... ..	1	3
<i>I. bütschlii</i> ... ..	—	—
<i>Lamblia</i> ... ..	10	13
<i>Chilomastix</i> ... ..	2	6
<i>Trichomonas</i> ... ..	2	3

Vegetative *E. histolytica* has been met with in two cases. One case was in a child three months old.

## II.—NATURAL *E. HISTOLYTICA* INFECTION AMONG DOGS

It has been recorded from America that street dogs are naturally infected with *E. histolytica*.

It was thought necessary to examine the street dogs in Cairo for *E. histolytica* and its cysts in order to find out if they can act as reservoirs for this infection. Specimens from 100 dogs were collected and examined. There was no infection of this nature in the dogs. Post-mortem examination of the large intestines of these dogs has revealed no ulceration.

Coccidiosis was met with in a dog that showed *Isospora canis* oocysts.

## III.—SCHISTOSOMIASIS

### A.—Epidemiology

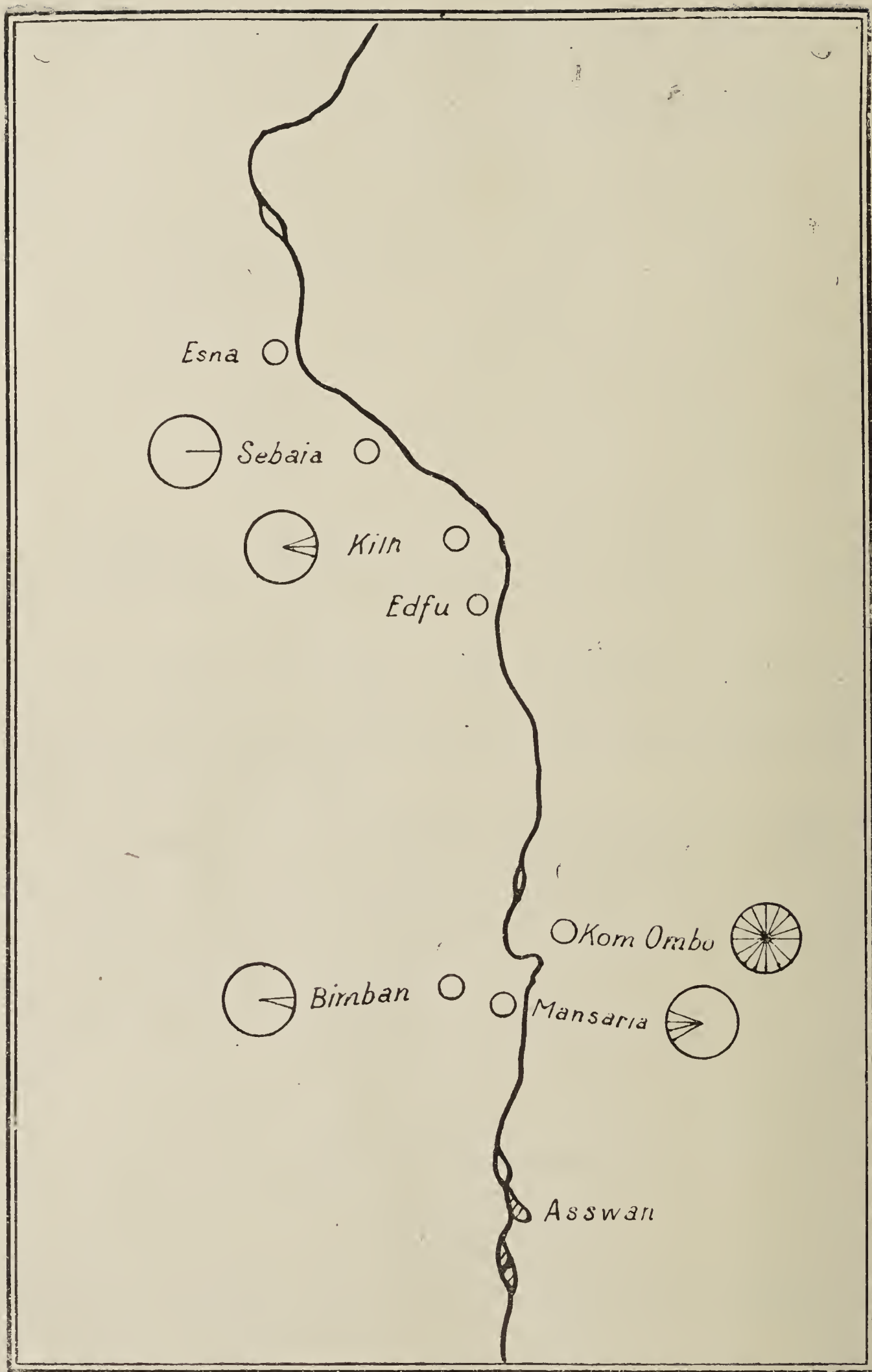
#### 1. *Bilharzia* Infection among Females attending the Children Welfare Centres in Cairo.

Urine examination from 116 adult females was carried out with the following results :—

Total number examined ... ..	116
<i>Bilharzia</i> infection ... ..	44

Out of these, (116) 28 cases had never left Cairo. 9 showed *Schistosoma haematobium* eggs in their urine. Further enquiry showed that 8 of these lived in suburban districts where filtered water was not






 *S. heamatobium*

FIG. 1.—Shows the distribution of infection with *Sch. heamatobium* in areas under basin irrigation in Upper Egypt.



available for drinking or domestic use. Search in these localities revealed *Bulinus* snails in the streams from which the people draw their daily supply of water, although no cercariae were met with on the occasions of examination.

There were 19 cases which were born in Cairo, but it was found that they had gone to the country for visits to their relatives.

The remaining positive cases came originally from the country.

## 2. *Bilharzia Infection in Areas under Basin Irrigation.*

In areas under basin irrigation, vesical bilharziasis is not very common and may even be absent in certain places. This can be easily explained by the absence or limited distribution of the snail intermediary, *Bulinus*, owing to the very dry and hot atmosphere and the absence of water from the cultivated fields, canals, etc.

Examination of 100 cases from different districts in this area gave the following percentage :—

Sibaia ... ..	00
Kilh ... ..	1
Bimban ... ..	3
Mansuria ... ..	11

There are certain estates in this area where water-lifting apparatuses are installed and continuous water for irrigation purposes was supplied, thereby creating conditions similar to those found in areas under perennial irrigation. In such places the percentage of *Schistosoma* infection reached 75 per cent. The molluscan intermediary was found thriving in the canals. This was seen in the following localities :—

Schistosoma infection	{	in Naga Hamadi ... ..	80 per cent
		in Kom Ombo ... ..	75 „ „

Recently, there were installed in this area electric lifting apparatuses for supplying water necessary for irrigation, thereby abolishing the system of basin irrigation. It was necessary to survey these places and study conditions before turning on these pumps and to find some means of guarding against the breeding of snails introduced in the water.

From the figures, it can be seen that as soon as the water is pumped up the main canal supplying the area, a valve keeps the water from running back to the river and allowing the water to remain in the canals. If arrangements could be made to open the valve as soon as irrigation is complete, the remaining water would be drained from the canal which would be dried up by the scorching heat of the sun and this will ultimately kill the snails.

Through the courtesy of the Mechanical and Electrical Department supervising these schemes, it was arranged that this precaution will be taken in all the places fitted with pumps with the exception of two left as controls. The results of these experiments will be reported later.

### B.—*Effect of Dryness on Snails*

It has been known that snails are killed by rapid desiccation. Barlow (1933) has shown that they can withstand the 40-day winter closure of water. This period is usually between the 25th of December and the 5th of February, but may extend to the 19th in certain localities. 300 *Planorbis* snails were collected from a canal on Feb. 19, 1934 and were kept dry in the cupboard in the laboratory. Samples were taken from these snails and put in warm water in order to determine the effect of further dryness on these snails.

25-2-1934 : Out of 30 <i>Planorbis</i> snails, 29 revived after 24 hours.							
12-3-1934 :	„	20	„	„	16	„	„ 24 „
20-3-1934 :	„	20	„	„	12	„	„ 24 „
2-4-1934 :	„	20	„	„	11	„	„ 24 „
19-4-1935 :	„	20	„	„	8	„	„ 24 „

It must be mentioned that the canals are not dry until about 15 days after the closure. From the above table it will be seen that the snails tolerated the absence of water for about  $3\frac{1}{2}$  months when they were sheltered from the direct rays of the sun. Under natural conditions, they burrow holes in the moist mud of the canal and remain there until the water comes back. This explains the reappearance of the snails which is commonly seen after the end of the winter closure. Their size is an evidence in favour of their survival.

### IV.—TREMATODE INFECTION AMONG SNAILS

The work was continued and snails of different species were examined. New unrecorded larval trematodes were met with. These were classified as follows :

From *Planorbis boissyi* :—

(1) Apharyngeal longifurcate cercaria which proved to be the larval stage of *Apharyngostrigea ibis*, a holostome of the buff-backed heron. The intermediary stages developed in the form of tetra-cotylae in the branchial clefts of tadpoles (under publication).

(2) Pharyngeal longifurcate cercariae which are under study.

(3) Apharyngeal brevifurcate cercaria with eye-spots which is still under investigation



## LONGITUDINAL SECTION

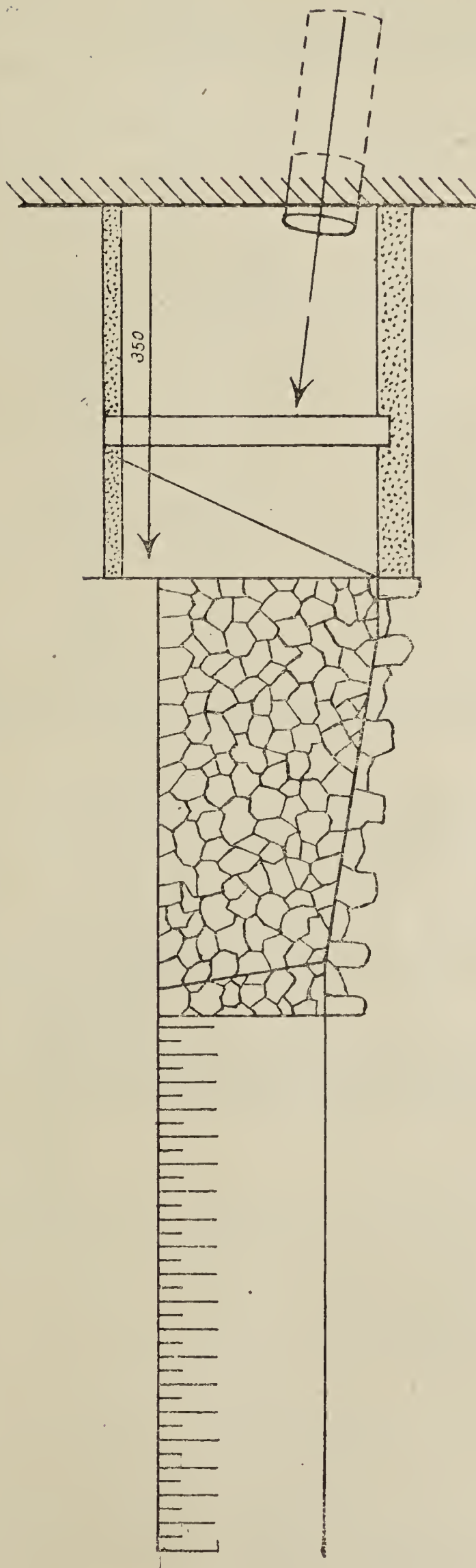


FIG. 2.—TYPE OF DISCHARGE BASIN OF MANSURIA AND BIMBAN.



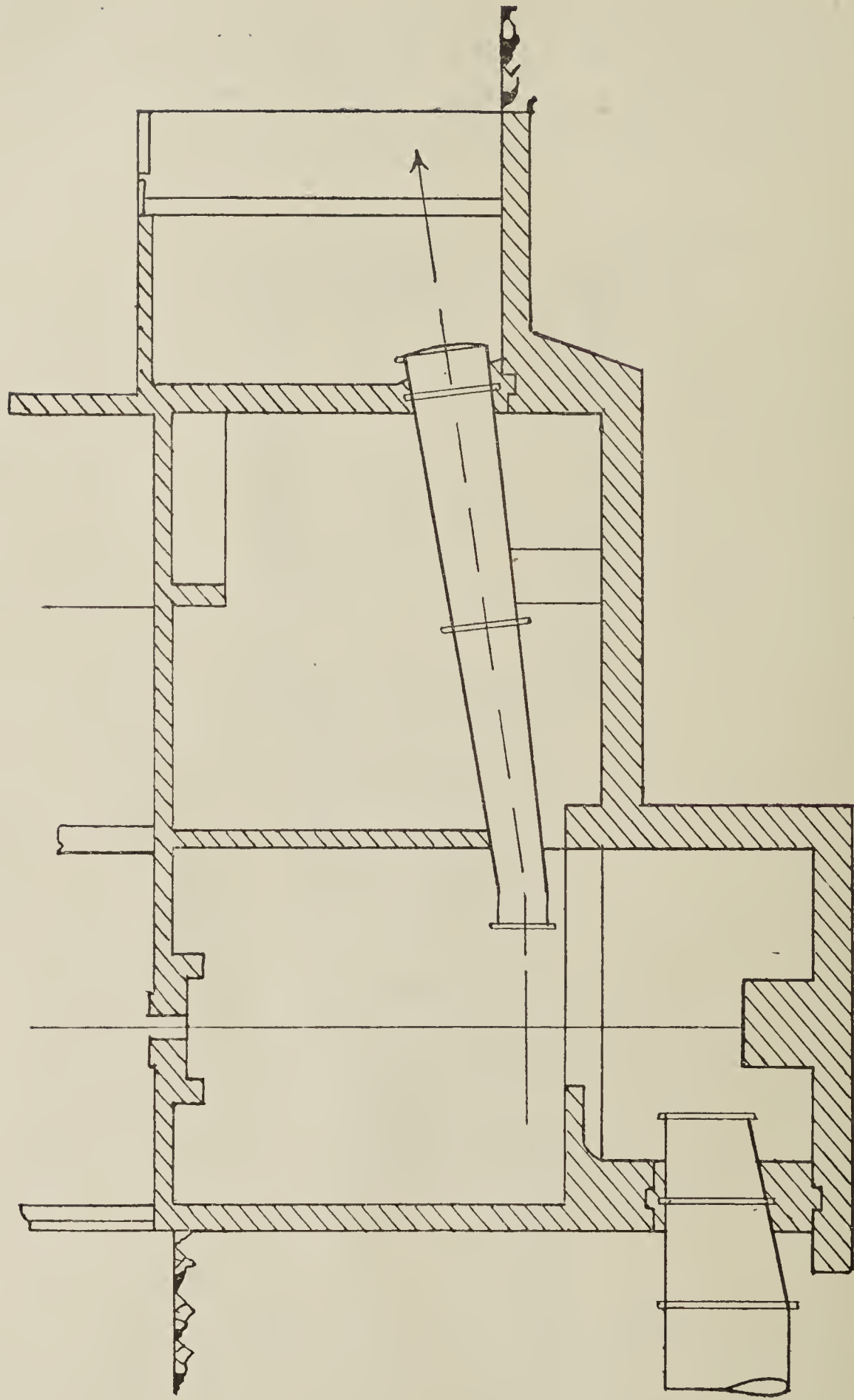


FIG. 3.—TYPE OF DISCHARGE BASIN OF RADISIA, ROMADI, KILH BOSAILIA, HIGZ AND SIBAIA.

(4) Gymnocephalous cercaria encysted in the livers of fish.

(5) From *Bulinus*, a xiphidocercaria which encysts in the snail host as well as in other snails and proved to be the larval stage of *Lepoderma ramlium* Looss, 1896 (*under publication*).

*From Melania tuberculata*:—

(1) Aschistosomatid cercaria was described and examined in detail (*under publication*).

(2) A small xiphidocercaria: This was proved to penetrate into an anopheline mosquito larva. They remain free in its coelom for 15 days and then migrate to the thoracic and abdominal muscles and encyst there, undergoing definite metamorphosis. The period necessary for this change to be complete is not definitely settled, although there is much evidence to show that it varies according to temperature.

(3) Gymnocephalous cercaria encysted in the snail host and in other snails. Further details of the morphology and life-history will be published later.

#### SECTION IV.—Medical Entomology

The work carried out in this section falls under the following headings:—

- (1) Identification of the Insects sent to the Institute.
- (2) Supervision of the work of the Khanka Malaria Research Station.
- (3) Field work: Malaria and mosquito survey at Ismailia, Fayoum Alexandria, Mersa Matrouh and Idkou.
- (4) Research Problems.

##### A.—Identification of Insects sent to the Institute

*Mosquito larvae*:

During the year 1934, 2,687 samples of water containing mosquito larvae were sent to the Research Institute for identification.

The samples were sent from the following places:—

(1) Malaria Research Station at Khanka	...	2,164	samples
(2) M.O.H. of the provinces	... ..	243	„
(3) Cairo Health Inspectorate	... ..	163	„
(4) Malaria Stations at Aswan, Fayoum and Ismailia, etc.	... ..	71	„
(5) Samples collected during field survey	...	45	„
Total	... ..	2,687	

DETERMINATION OF SPECIES OF MOSQUITO LARVAE TOGETHER WITH THEIR LOCALITY AND SEASONAL DISTRIBUTION,  
(SENT BY THE M.O.H. OF THE PROVINCES)

Species	Qaliub			Benha			Etia el-Baroud			Kom Hamada			Zagazig			Beba			Total
	Oct.	Nov.	Dec.	Oct.	Nov.	Dec.	Oct.	Nov.	Dec.	Oct.	Nov.	Dec.	Oct.	Nov.	Dec.	Oct.	Nov.	Dec.	
Anopheles pharoensis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	28
A. multicolor	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21
Theobaldia longiareolata...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Ur. unguiculata...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	17
Aedes caspius	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	44
Aedes aegypti	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Culex pusillus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7
C. laticinctus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
C. quasigelidus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
C. perexiguus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	88
C. pipiens	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	86
C. laurenti	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	40

From the above table one may conclude that the prevalent Anophelines in these provinces are A. pharoensis and A. multicolor.  
The commonest culicines are Culex perexiguus and Culex pipiens.



DETERMINATION OF SPECIES OF MOSQUITO LARVAE TOGETHER WITH THEIR  
LOCALITY AND SEASONAL DISTRIBUTION, (SENT BY CAIRO CITY HEALTH  
INSPECTORATE)

Species	Sept.	Oct.	Nov.	Dec.	Total
Anopheles pharoensis ... ..	10	1	—	—	11
A. multicolor ... ..	—	2	5	1	8
A. mauritanus ... ..	—	1	—	1	2
Aedes aegypti ... ..	3	12	—	26	41
Aedes caspius ... ..	11	6	2	—	19
Theobaldia longiareolata ...	—	—	—	3	3
Uranotaenia unguiculata ...	—	—	—	—	—
Culex pipiens... ..	17	27	21	9	74
„ perexiguus ... ..	35	5	5	—	45
„ laticinctus ... ..	2	5	5	2	14
„ laurenti ... ..	3	2	1	—	6
„ pusillus - ... ..	—	1	—	—	2

From the above table one may conclude that the prevalent Anophelines in Cairo are *A. pharoensis*, *A. multicolor* and *A. mauritanus* in the order mentioned.

The most prevalent culicines are *Culex pipiens* and *C. perexiguus*. The former is a proved carrier of filaria infection. In 1931, a filaria survey of Kafr Ghatati, a small village about 2.5 kilometres north of the Giza Pyramids, was undertaken by Prof. Khalil Bey. It was then shown that 25 per cent of the inhabitants had filaria in the blood among 1,000 people examined. It is hoped to extend this survey in 1935 to the suburbs of Cairo owing to the prevalence of the mosquito carrier.

The presence of 41 specimens of *Aedes aegypti* collected from various parts of the city is of some significance. A close inspection of the movements of individuals arriving in Egypt from countries in which yellow fever is endemic, should be made.

Owing to the future development of airway transport, the neighbourhood of all aerodromes in Egypt should be examined, and active steps must be taken to eradicate any breeding place of this mosquito.

*Aedes aegypti* is a domestic mosquito and its favourite breeding place is the small collection of water found in Zeer (earthenware filters) or tins which are used to protect cupboards from the attack of ants.

The locality distribution of specimens sent for identification is as follows :—

Shubra District 17, Sayda Zeinab 6, Giza 5, Bulaq 4, Old Cairo 3, Mouski 1, Darb el-Ahmar 1, Abdin 1, Maadi 1, Qaliub 1.

DETERMINATION OF SPECIES OF MOSQUITO LARVAE SENT  
BY THE MALARIA STATIONS IN THE PROVINCES

Species	Abu Qir	Kafr el-Dawwar		Ismailia			Fayoum			Aswan			Total
	Sept.	Aug.	Sept	May.	July	Aug.	Sept	Oct.	Nov.	Oct.	Nov.	Dec.	
Anopheles multicolor ... ..	1	—	—	—	—	—	6	1	—	5	—	5	18
A. pharoensis ...	1	—	—	2	1	1	—	—	1	—	—	—	6
A. sergenti ... ..	—	—	—	—	—	—	—	4	2	—	—	—	6
A. mauritanus ...	—	1	—	—	—	—	—	—	—	—	—	—	1
Aedes caspius... ..	—	—	—	—	—	—	4	2	2	—	—	—	8
Uranotaenia ... ..	—	—	1	—	—	—	—	—	1	—	—	—	2
Unguiculata ... ..	—	—	—	—	—	—	—	—	—	—	—	—	—
Theobaldia longiareolata... ..	—	—	—	—	—	—	—	—	—	—	—	—	—
Culex pipiens... ..	—	—	—	—	—	—	—	10	—	7 2Aug	1 7	12 Sept.	39
„ perexiguus ...	—	—	—	—	—	—	4	4	4	—	4	—	16
„ laurenti ...	—	—	—	1	—	—	—	2	3	—	—	—	6
„ laticinctus ...	—	—	—	1	—	—	—	—	—	—	—	—	1

From the above table one may conclude that the prevalent mosquitoes in these stations are Anopheles pharoensis and A. multicolor. Anopheles Sergenti is limited in its distribution to the Fayoum Province. Culex pipiens and C. perexiguus are the two commonest larvae collected.

DETERMINATION OF SPECIES OF LARVAE COLLECTED DURING FIELD WORK

Field Surveys	Date	Anopheline				Culicini				Culex						
		mauritanus	pharoensis	multicolor	Sergenti	Theobaldia	Uranoaenia	Aedes caspius	Aedes aegypti	Culex pusillus	C. latinctus	C. quasigellidus	C. tipuliformis	C. perexignus	C. laurenti	C. pipiens
Ismailia ...	22- 3-1934	—	—	—	—	—	—	2	—	—	1	—	—	1	1	—
Fayoum ...	6- 6-1934	—	5	1	2	1	—	—	—	1	1	—	1	4	4	2
Alexandria ...	4- 7-1934	—	9	1	—	—	3	2	—	—	—	2	—	1	7	1
Mersa Matrouh ...	17- 9-1934	—	—	5	—	16	—	—	—	—	1	—	—	—	—	12
Donosher ...	5- 8-1934	2	8	—	—	—	—	—	—	—	—	3	—	4	8	3
Kafr el-Dawwar	18-10-1934	2	4	3	—	—	1	2	3	1	—	2	—	—	8	2
Edku ...	18-12-1934	—	1	3	—	—	—	—	—	2	—	—	—	—	—	1
TOTAL		4	27	13	2	17	4	6	3	4	3	7	1	10	28	21



## IDENTIFICATION OF FLEAS SENT TO THE INSTITUTE

The Infectious Diseases Section of the Public Health Department and the Quarantine Service sent several consignments of fleas for identification.

The specimens sent from the Infectious Diseases Section were collected from several villages in Giza and Assiut.

The determination of species of 161 specimens examined, showed the presence of two species only, namely:

Species	Number examined	Percentage
		%
1. <i>Xenopsylla cheopis</i> ... ..	149	92
2. <i>Xenopsylla chephrenis</i> ... ..	12	7

*X. cheopis* was found in specimens collected from Giza and Assiut, whereas *X. chephrenis* was in found only specimens collected from Giza.

The specimens sent from the Quarantine Service were collected from Port Said and Port Tewfik.

The determination of species of 883 specimens examined showed the presence of the following :—

Species	Number examined	Percentage
		%
<i>Xenopsylla cheopis</i> ... ..	851	96·3
<i>Leptopsylla musculi</i> ... ..	25	2·8
<i>Ctenocephalus felis</i> ... ..	5	0·56
<i>Xenopsylla chephrenis</i> ... ..	2	0·23

## MALARIA SURVEY AT ABOU SOUER AND ISMAILIA

A malaria survey of Abou Souer and Ismailia was undertaken on March 23, 1934. The survey lasted 2 days.

The following places were visited :—

(1) *Abou Souer Royal Air Force Camp* (see map 1).

No breeding places were found, and we were informed by the Medical Officer in charge that no small collection of water was allowed to remain in the camp. The fire buckets were filled with sand.

(2) *Shalakani's Farm*.

The farm is about 7 kilometres north of R.A.F.C. No larvae were found then; but later on *Anopheles pharoensis* and other culicines (see map 1) were collected from neighbouring places.

(3) *El-Maskhouta Village and Swamp*.

The village is about  $3/4$  of a kilometre south-west of the R.A.F.C. *Anopheles pharoensis*, *Aedes caspius* and four species of culicines were collected.

(4) *Examination of Small Puddles along the Side of Ismailia Canal*.

Most of the puddles were dry then; the remaining few contained no larvae, but they are likely breeding places for mosquitoes.

(5) *Examination of the Sewage Farms of Abou Souer and Ismailia Military Camp*.

No larvae were found in Abou Souer farm at Abou Gamoos, near the Ismailia farm. *Anopheles pharoensis*, *Uranotaenia unguiculata* and *Culex laurenti* were collected by the M.O.H.

(6) *Slaughter-house at Ismailia*.

*Culex pipiens* larvae were found breeding in enormous number in a well behind the slaughter-house.

(7) *Water Channel near Toson Drain*.

*Culex perexiguus* was found.

In addition to the above, several consignments of mosquito larvae were sent by the M.O.H. of the district to the Research Institute for identification. The distribution of the several species is shown in map 1.

It will be noted that four anopheline species were collected from Serapium, while *Aedes aegypti* (the yellow fever mosquito) was collected from 2 small drains at Abou Gamoos, and from an earthenware jar (Zeer) in a farm, near Ismailia Camp.

28 blood films were taken from the inhabitants of the Shalakani's farm and Ezbet el-Maskhouta, 9 of which were positive for Malaria.



### *Recommendations.*

(1) Drainage of the swamps, lying along the Mahasma drain, especially those within 5 kilometres radius of the R.A.F.C. at Abou Souer, and the Royal Military Camp at Ismailia is probably the best method of permanent control, and immediate steps should be taken to consider this project; meanwhile, temporary measures such as oiling, fish control, etc., should be adopted. Fishing or duck shooting should be prohibited in any of these swamps.

(2) The sewage disposal of the *moaskar* at Ismailia may be connected to the main sewer. This will eliminate any breeding place being formed through leakage.

(3) In dredging operations, steps should be taken not to allow collection of water to remain for more than one week.

(4) Irrigation channels made by the Suez Canal Company should be closely inspected.

(5) A thorough malaria survey of the inhabitants should be made. Drug treatment and prophylaxis by Quinine, Plasmochine and Atebrine should be undertaken.

### PRELIMINARY MOSQUITO SURVEY OF ALEXANDRIA AND ITS ENVIRONMENT

A mosquito survey of Alexandria was carried out in July 1934 under the direction of Prof. Khalil Bey <sup>(1)</sup>.

The following places were examined (*see map 2*):—

- (1) The Dekhela Aerodrome.
- (2) The Abu Qir Aerodrome.
- (3) The Montazah Palace.
- (4) Torriel Garden City.
- (5) Siouf Garden City.
- (6) Sammouhah Garden City.

The object of examining the neighbourhood of the Aerodrome was to discover suitable breeding places for *Aedes ægypti* (the yellow fever mosquito). This was done as a precautionary measure against the possible introduction of yellow fever in Egypt from infected countries on account of the future development of airway transport.

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<sup>(1)</sup> See P.H.D. Publication Technical Bull. No. 2. "On Combating Mosquitoes and Malaria in Alexandria and its Environments", by Prof. M. Khalil Bey.



Torriel, Siouf and Sammouhah Garden Cities are being transformed into building sites and some houses have already been built. A mosquito survey of these places is, therefore, essential before they become densely populated.

The survey revealed the presence of the following species (see map 2):—

- (1) *Anopheles pharoensis*.
- (2) *Anopheles multicolor*.
- (3) *Aedes caspius*.
- (4) *Uranotaenia unguiculata*.
- (5) *Culex laurenti*.
- (6) *Culex pipiens*.
- (7) *Culex quasigelidus*.

As an anti-malarial measure, advantage could be taken of the Mex and Tolombat Pumping Stations to lower the water level at Torriel and Siouf, thus reducing the number of breeding places in these parts of the city.

#### MOSQUITO SURVEY OF MERSA MATROUH (SEE MAP 3)

The Mosquito survey of Mersa Matrouh was undertaken in answer to a complaint from the Governor of the Western Frontier about the increased number of mosquitoes at the Lido Hotel which caused a great annoyance to the visitors.

The survey started on the 18th of September and was finished on September 21, 1934.

The following places were examined for mosquito larvae. (see sketch map 3):—

(1) The water cisterns and sewage tanks of the Lido Hotel, the two Government villas and the mosque.

(2) Wells and water cisterns within three kilometres radius from the Lido Hotel.

(3) Roman wells within three kilometres radius from the Mersa Matrouh Aerodrome.

(4) Kasr el-Mahagib Wells, the Roman wells supplying water to the Hotel, and the shore of the salty-lagoon situated to the west of the Lido Hotel.

1. *The Lido Hotel.*

The water cistern on the roof of the Hotel was examined for mosquito larvae with negative result. All the syphon cisterns, and sewage tanks were examined and no mosquito larvae were found, though a few adult *Culex pipiens* were found sheltering under one of the covers of the sewage tanks.

Adult mosquitoes were collected mainly from the ground floor, and bedrooms of the Hotel on three successive nights. The total number of mosquitoes collected were 78 female *Culex pipiens*. No Anopheline mosquito was found. In addition to the Culicines collected, a large number of chironomus flies, males and females, were noticed dancing around the light. These flies resemble mosquitoes and are often mistaken for them. They differ, however, from mosquitoes by being attracted to light whereas mosquitoes are found in dark corners.

The water cisterns and sewage tanks of the two Government villas and the mosque were examined for mosquito larvae with negative result.

2. *Examination of the Wells in Neighbourhood of the Lido Hotel.*

The following wells were examined (see sketch map 3):—

(a) Sineyet el-Asi Wells: These wells are at 500 metres south-west of the Hotel. The water in the wells is mainly sold to the people for drinking purposes. All the wells in this area were examined and in three of them, the following larvae were collected:—

*Culex pipiens*.

*Theobaldia longiareolata*.

Chironomus larvae.

(b) Well in el-Sayed Garden: *Culex pipiens* and *Theobaldia longiareolata* were found.

(c) Well in Ezbet el-Magharba: *Theobaldia longiareolata* was found.

(d) Three wells in the Government Garden.

*Culex pipiens* and *Theobaldia longiareolata* were found in large numbers. It should be noted that these wells are partially covered and the water is pumped out for irrigation purposes.

(e) Wells and sewage tanks of the Governor's House: No larvae were found.

(f) Well in Gildo's Garden: *Culex pipiens* and *Theobaldia longiareolata* were found.



(g) Government's water cistern: The water is pumped into the cistern from steamers calling at Mersa Matrouh and carrying water from Alexandria. The inlet pipe is passed through one of the man-holes of the roof of the cistern. No mosquito larvae were found.

(h) Water cistern south of the Government Hospital: *Culex pipiens* and *Theobaldia longiareolata* were found in large numbers.

### 3. *Examination of Wells in the Neighbourhood of the Mersa Matrouh Aerodrome.*

In view of the future development of travel by aeroplane and to minimise the danger of the spread of yellow fever, the wells in the neighbourhood of the aerodrome were examined to find out if *Aedes aegypti* (the yellow fever mosquito) is breeding in them. In three wells, *Culex pipiens* and *Theobaldia longiareolata* were found. No *Aedes aegypti* were present.

### 4. *Examination of the Wells of Kasr el-Mahageeb.*

Kasr el Mahageeb is a small farm, 7 kilometres south-west of the Lido Hotel.

The land belonging to this Ezbeh is irrigated by means of shallow pits in the sand. The following mosquito larvae were found in the wells examined:—

*Anopheles multicolor.*

*Culex pipiens.*

*Culex laticinctus.*

*Theobaldia longiareolata.*

The Roman well about a kilometre from Kasr el-Mahageeb was examined for mosquito larvae with negative result.

The water of the well is drawn by means of a motor pump and is then carried on a motor-lorry for distribution.

The shore of the salty lagoon situated on the western side of the Lido Hotel was examined and no mosquito larvae were found.

### *Conclusions and Recommendations.*

(1) The mosquito larvae found in wells and cisterns in the neighbourhood of the Lido Hotel are:—

*Culex pipiens.*

*Theobaldia longiareolata.*

*Culex pipiens* is a domestic mosquito which readily bites man. It is the commonest mosquito found in houses.



*Theobaldia longiareolata* seldom enters houses and does not bite man.

(2) The main source of mosquitoes found in the Lido Hotel are the well of el-Asi, and the Government garden, etc. These wells are situated within the region of flight of *Culex pipiens*. The Lido Hotel and the two Government villas are their favourite refuge.

This is supported by the fact that all the mosquitoes caught in the Hotel are females which shows that the breeding place is at some distance from the Hotel.

The control of mosquitoes in Mersa Matrouh and the Lido Hotel is comparatively an easy matter as the breeding places are confined to wells, cisterns and shallow pits. Special attention should be paid to the following points :—

(1) Disused wells should be filled or provided with a cement concrete cover. Wells used for drinking purposes should be provided with a pump and a concrete cover. Wells used for irrigation purposes should be either oiled once a week or the fish *Heterobranchus*, “the common Karmut” should be introduced.

(2) Government water cisterns should be cleared as some are full of mosquito larvae. They should have closely fitting covers over the manholes and the inlet pipes should not enter the cistern through the manholes.

(3) Introduction of the fish *Gambusia affinis* in the Roman cisterns should be tried, these cisterns are potential breeding places for mosquito.

(4) Potential breeding places in the Hotel, such as water cistern, sewage tanks, etc., should be regularly inspected. Complete screening of the Lido with phosphorised bronze screens is a justified measure.

(5) Success of anti-mosquito measures will depend on the ability and trustworthiness of a well-trained malaria inspector (Mulahez) working under the direction of the P.M.O. The duty of the malaria inspector is to inspect and control all breeding places within a seven kilometres radius of Mersa Matrouh.

#### ORGANISATION OF THE KHANKA MALARIA RESEARCH STATION

The work carried out in the Station includes the following :—

(1) Field work.

(2) Work carried out inside the station.

## Field Work.

In August 1934, the Sanitary Engineer, M. H. Marzouk Eff. started his investigation on the topography, and the control of the breeding places in the area.

The area controlled by the Khanka Malaria Research Station lies mainly in the Qaliubia Province. Its extreme northern corner lies in the Sharkia Province (see map 4). The distance from south to north is 24 kilometres, while the distance from east to west is 7 kilometres on the average. The total area is about 180 square kilometres, or 45,000 feddans.

The soil of the area is mostly sandy especially along its eastern boundary, where it abuts on the desert. Along the Ismailia Canal there is an interrupted strip of brown porous cultivated land. The interruptions are due to sand quarries. At Abu-Zaabal there is a vein of basalt.

The area is mostly flat, except along its eastern boundary, where it rises up gradually to about 15 metres above the average. The region of the Belbies drain, especially at its beginning, is lower than the average level.

The main irrigation channel in the area is the Ismailia Canal. It takes its water from the Nile at Shubra el-Kheima and ends at Ismailia by giving off two branches. Its total length is 125 kilometres. The main branches supplying the area are :

Tewfikia Canal.

Kashmir Youmna.

Kashmir Yousra.

Riah el-Minair.

The maximum and minimum water levels are as follows (see graph 1) :—

(1) At Tewfikia Canal intake (southern limit of area) :

15.80 metres above sea level ... .. Flood level.

14.12 „ „ „ „ „ „ „ „ Low „

(2) At Siriakos lock up-stream 15.10 metres above sea level } Flood  
„ down-stream 14.20 „ „ } level.

„ up-stream 12.10 „ „ } Low

„ down-stream 12.5 „ „ } level.

(3) At Riah el-Meniar intake 13.10 metres above } Flood  
sea level ... .. } level.

At Riah el-Meniar intake 11.10 metres above } Low  
sea level ... .. } level.



The designed hydraulic slope of the Canal is 10 cms./km.

In the winter closure (December, January, February and in the summer low levels the Canal acts as a drain to the adjacent lands.

The Tewfikia Canal is 10 kilometres long and the intake flood level is 15.80 metres above sea level, while the maximum level of the adjacent land in el-Birka village is about 15 metres, which explains the occurrence of marshy lands in this area (*see map 4*).

The water level in Ismailia Canal directly controls the water level in its branches. An average hydraulic slope of 10 cms./km. could be deducted from the levels of the canal to get the level at any point in their course.

The fluctuation of the ground water level ranges from 1 to 2 metres. The highest water level is reached in October and November, *i.e.* a month after the beginning of the flood. This is the best time for the detection of Birkas. The lowest level is reached during the winter enclosure and in summer time, *i.e.* January, February, June and July. This is the best time to undertake filling or drainage operations.

#### *Drains.*

The main drains of the area are (*see map 4*) :

Belbeis drain.

Gebel el-Asfar drain.

Belbeis drain begins from the Birka village and goes north by west until Siriakos, then it straightens up to the north until it reaches Abu-Zaabal town, where it passes through a syphon under Ismailia Canal. It then proceeds north by east till it joins Bahr el-Bakar drain. The total length is 63 kilometres. The designed maximum flood level is 12.80 metres at el-Birka village, but the measured actual levels for several years have shown an average of 12.90. The pump at kilometre 60.40, which is now under construction, will reduce the level to 11, *i.e.* 1.80 below the present level and thus the Birka swamps will be completely dry after the completion of the project.

The maximum flood level of Belbeis drain as measured at three important points are (*see graph 2*) :

12.20 metres above sea level at Birka village.

11.75    „        „        „        „    up-stream of Abu-Zaabal syphon.

11.70    „        „        „        „    down-stream of Abu-Zaabal syphon.

The bed slope is 9 cms./km. but the hydraulic slope, as actually measured, is only 4 cms./km. The slope and running velocity are unstable and are affected by the heavy growth of vegetation along the course of the drain.





Sand quarries facing Abou-Zaabal Prison. Typical breeding place of *A. multicolor*.  
Note salty nature of ground.







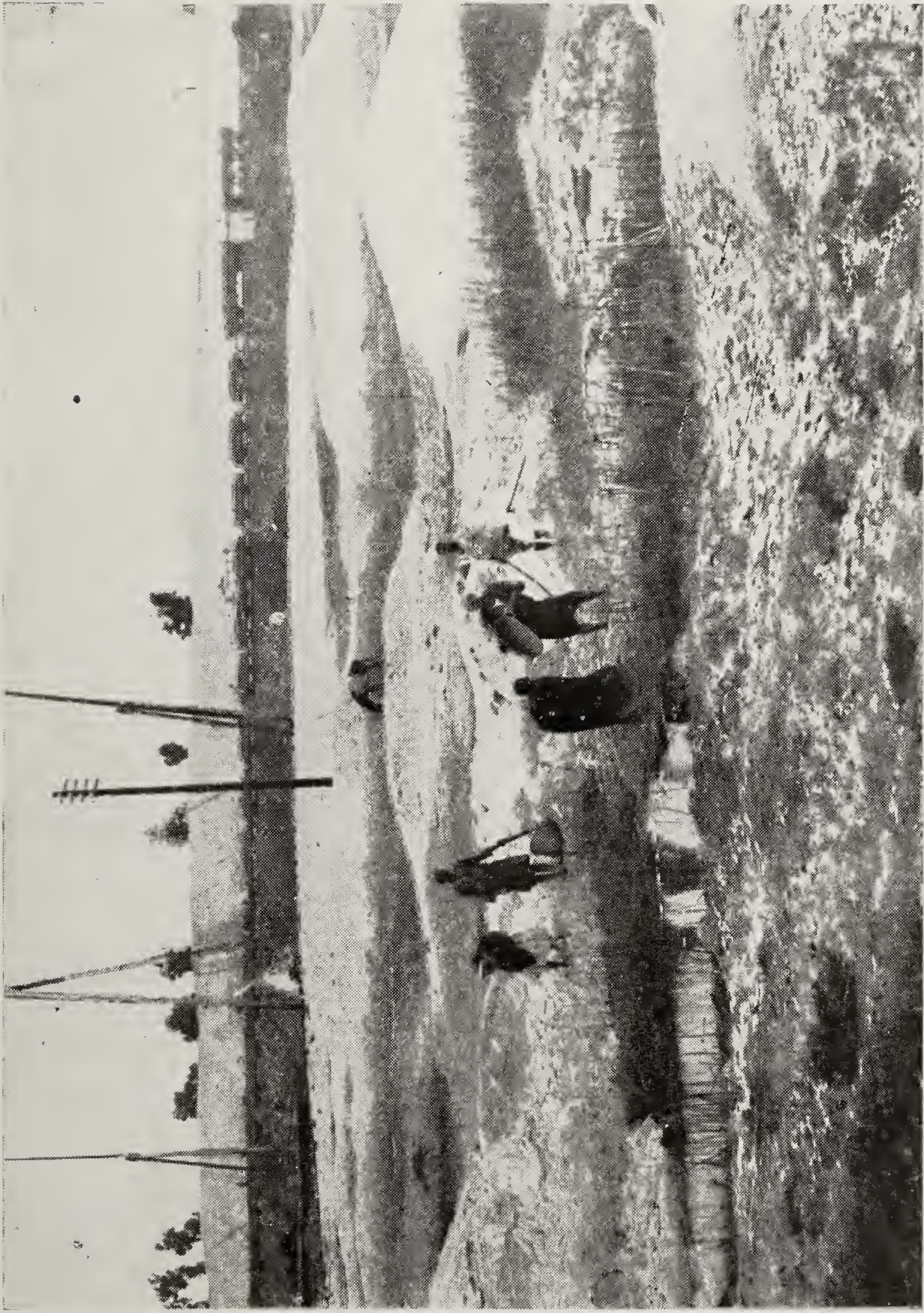


Sand quarries facing Abou-Zaabal Prison.  
Malaria Inspector collecting A. multicolor from edge of pool.







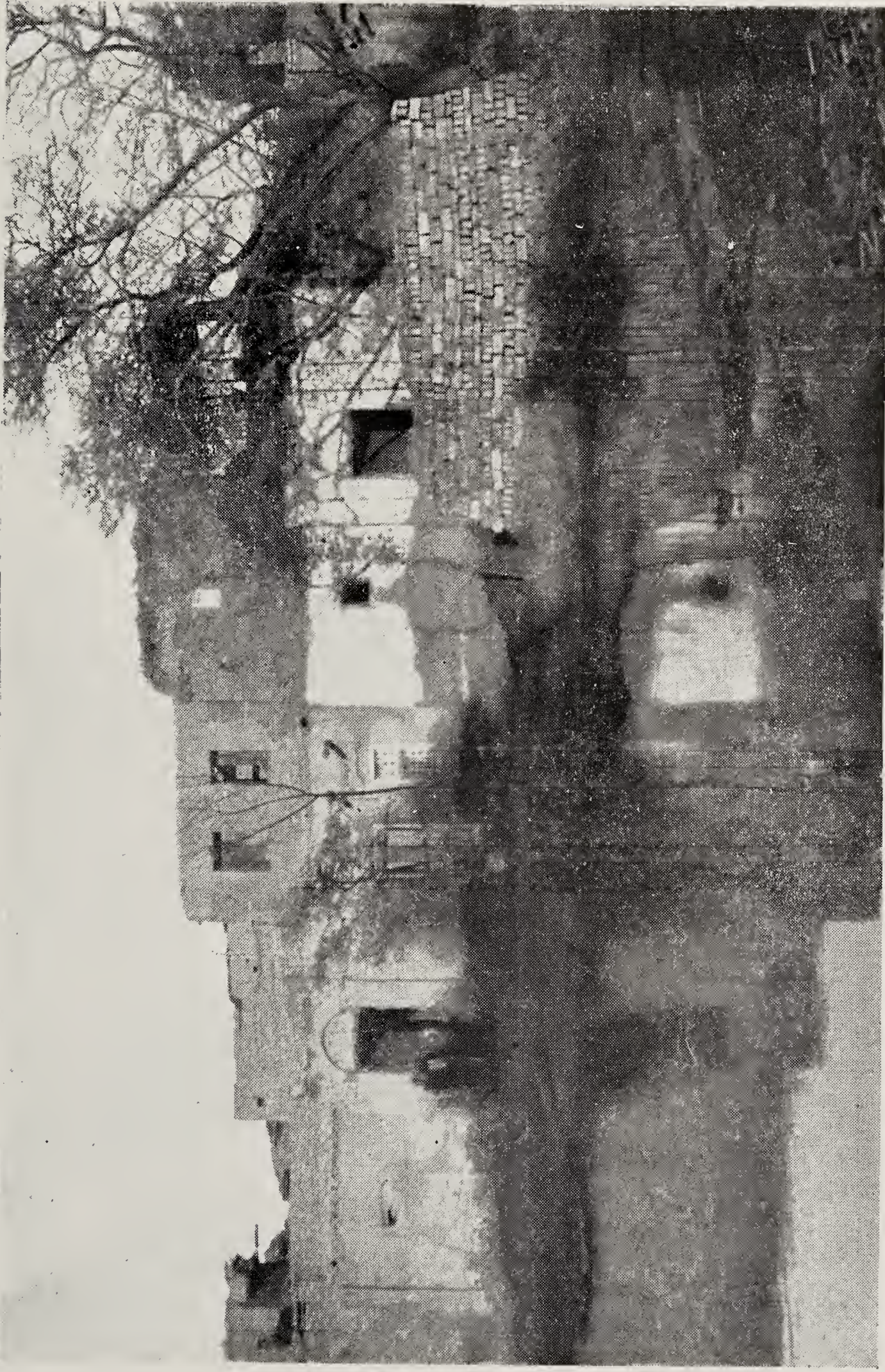


Sand quarries facing Abou-Zaabal Prison.  
Labour Corps of Malaria Station filling excavations.









Birka in Sindiwa village, caused by brick-making. Breeding place of *A. multicolor*











Shady drain at Mershaka farm, Abou-Zaabal. Breeding place of *A. mauritianus*.



Gabal el-Asfar drain was made in 1925/1926 in consequence of an outbreak of malaria in 1924. It begins at 500 metres from the Khanka Sewage farm and passes through Birket el-Hag and Birket el-Akrasha till it joins Belbeis drain at Abu-Zaabal. The total length is 7 kilometres. The designed maximum level at the beginning is 13·70, but the measured level for several years reached 14. The hydraulic slope could have been 23 cms./km. as the levels allow, but owing to the scouring effect of the resulting high velocity it was decided to construct a weir at km. 3·15 to give it a normal hydraulic slope (see graph 3). The drain joins Belbeis drain at a designed level of 12·10, but measured level has always shown 11·75. In general it has a good running capacity, but a heavy growth of weeds in certain parts affect the regularity of the flow.

The crops of the area are maize, barely, wheat, clover, cotton; rice and grass. The latter two crops are important from the malaria point of view. Rice cultivation is on the increase in the area, partly on account of the salty nature of the land and partly on account of lack of proper drainage. Grass growing is practised in El-Birka village. Steps have been taken to stop this cultivation as it is a source of numerous breeding places.

The chief villages of the area are Abu-Zaabal, El-Khanka, Siriakus, El-Kalag, El Khosous, Kafr Hamza, Kafr el-Shorafa, etc. In addition to the above, there are some important Government institutions such as the Prison in Abu-Zaabal, the Mental Hospital at Khanka, the Leprosy Hospital and the Railway workshops and residence, etc. The total population of the area is about 60,000. The distribution of the population is not uniform, as is shown in the following table and graph 14.

Town	Number of Inhabitants	Number of Houses	Inhabitants per sq. Kilometre
Abu-Zaabal ... ..	9,827	1,650	300
El-Birka ... ..	3,234	586	107
El-Khanka ... ..	8,367	11,429	805
El-Khosous ... ..	3,087	571	343
Siriakos ... ..	8,380	1,532	479
Sindiwa ... ..	3,451	734	644
El-Kalag ... ..	5,474	974	315
Kafr-Hamza ... ..	2,134	350	485
Kafr Sindiwa ... ..	1,124	263	703
Kafr el-Shorafa ... ..	2,751	576	803
Kafr Ebian ... ..	2,551	484	500
El-Marg ... ..	2,252	1,121	861
Gabal el-Asfar Farm ... ..	707	164	048



Town	Number of Inhabitants	Number of Houses	Inhabit. per Sq. Kilometre
El-Manayel ... ..	1,407	278	370
El-Meniar ... ..	3,534	736	290
El-Menaiah ... ..	631	116	274
Mostoroud ... ..	2,302	401	411
TOTAL ... ..	60,379	21,255	—

Form the above table and graph 4 the following may be seen :—

(1) The density of population per sq. kilometre shows a wide range, being 861 in Marg and 48 at Gabal el-Asfar.

(2) The inhabitants per house are 3 persons on the average, each house has usually one bed-room. It is built of mud bricks with a thatched roof, in which mosquitoes find a safe refuge.

In undertaking permanent control measures, the question of housing and density of population has been considered.

### FACTORS AFFECTING THE BREEDING PLACES OF MOSQUITOES IN THE AREA

#### 1. *Rain Water.*

As a source of mosquito breeding can be neglected as it does not exceed 5 centimetres in the year, moreover, rain-water is not retained on account of the sandy nature of the soil.

#### 2. *Canals and Drains.*

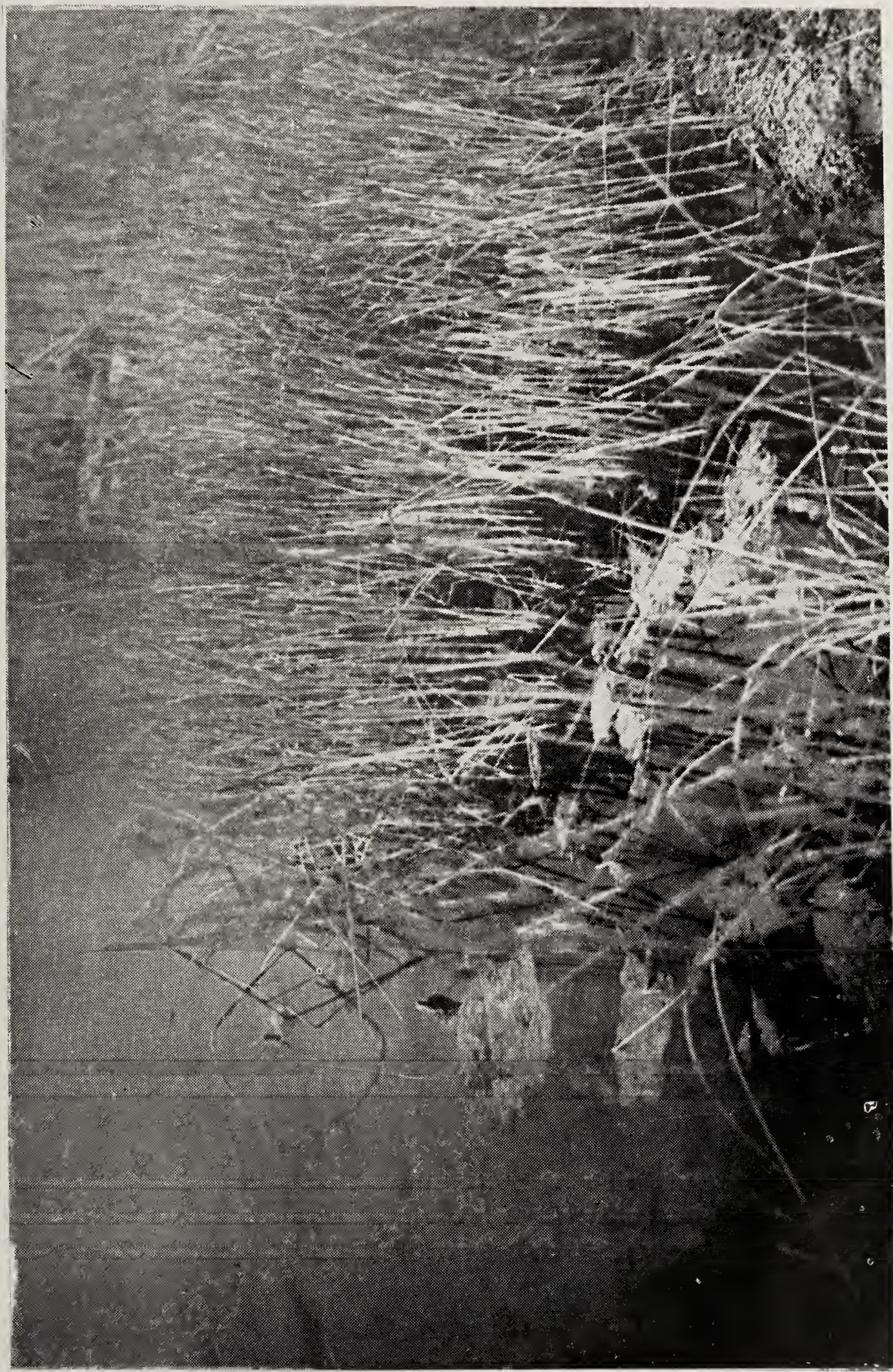
The main canals are free from breeding places. The subsidiary branches and the dead end of the canals afford breeding places for *Anopheles multicolor* and *Culex pipiens*, especially during the winter enclosure when the canals are at a low level.

The subsidiary drains afford numerous breeding places for *Anopheles multicolor*, *Aedes caspius*, *Theobaldia longiareolata* and *Culex pipiens*. Rice-field drains are the favourite breeding places for *Anopheles pharoensis* and *Culex laurenti*.

#### 3. *Stagnant Water.*

(a) *Wells.*—There are numerous shallow wells in the area used for irrigation and drinking purposes. The mosquito larvae found





Birkah N. of Abou-Zaabal Prison. Breeding place of *A. multicolor*









Birkah in Sindiwah, caused by infiltration water from adjacent irrigation canal.  
Breeding place of *A. multicolor*.









Birkah in Sindiwah, caused by infiltration water from adjacent canal.  
Breeding place of *A. multicolor*.





in these wells are : *Culex pipiens* and *Theobaldia longiareolata*. From the malaria point of view the wells could be neglected, as no Anopheline larvae have hitherto been found in them.

(b) *Sakias*.—When continuously used are free from mosquito larvae, If not used for over a week they afford breeding places for *Culex pipiens*, *Theobaldia* and *Aedes caspius*. In some Sakias, where the water is flush with the ground and where there is an abundant growth of vegetation, *Anopheles pharoensis* have been found.

(c) *Rice Cultivation*.—This is the favourite breeding place for *Anopheles pharoensis*. Rice cultivation is on the increase and is an important factor in the spread of malaria. The problem of control is difficult and its solution lies in a change in the method of cultivation or improved drainage of the area, thus allowing other crops to be grown instead.

(d) *Birkas and Swamps*.—The total number of birkas of the area is 87 with a total area of 106 feddans. The distribution of these birkas is as follows (see table and map 1, and graph 5).

Town	Number of Birkas	Area in Feddans
Abu-Zaabal and Kafr Ebian	15	43·5
El-Birka and Ezbet el-Gammaa and Ezbet Mikhail	4	19·0
El-Khanka... ..	8	4·0
El-Khosous ... ..	13	27·0
Siriakos ... ..	9	13·0
Sindiwa ... ..	8	3·0
El-Kalag ... ..	1	—
Kafr Hamza ... ..	2	1·4
El-Marg ... ..	8	4·0
El-Manayel ... ..	3	0·4
El-Menaiah ... ..	3	1·0
El-Menaiar ... ..	2	3·0



The underlying cause of these birkas and swamps is infiltration water. This is due to the fact that the level of cultivated land in Egypt, north of Assuit is below the level of the Nile during high flood. Analysis of the factors causing the outcrops of the infiltration water in the area controlled by Khanka Malaria Research Station shows the following (see graph 5) :—

- (i) *Natural Depressions and Seepage from Adjacent Land.*—As an example of this are the swamps in El-Birka village. This factor is responsible for 15 per cent of the total surface of the birkas.
- (ii) *Direct Seepage from the Ismailia Canal in the small birkas along the side of the Canal.* This factor is responsible for 2 per cent of the total surface of birkas.
- (iii) *Sand Quarries and Stone Quarries (see photos 1-3).*—The land which is used as sand quarries belongs to the Mining Department. It is rented to the people to dig out the sand for building purposes. In some cases the contractors go beyond the level of subsoil water and thus vast areas of water are left as breeding places for *Anopheles multicolor*. This factor is responsible for 27·5 per cent of the total area of the birkas. Steps have been taken by Mining Department to fine and suspend the licence of any contractor causing such birkas.
- (iv) *Brick Making (see photo. 4).*—Most birkas found in villages in Egypt have been originally caused by excavating the land in order to build the villages. This factor is responsible for 50 per cent of the birkas.
- (v) *Railway and Highway Burrow-pits.*—This is responsible for 2·4 per cent of the total area of birkas.

In addition to the factors mentioned; other minor factors contribute in the causation of small birkas, such as disused wells, drains, Gofaras and Sarbs <sup>(1)</sup>.

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<sup>(1)</sup> Gofara is a birka used for irrigation purposes. Sarb is a birka for draining purposes.

The mosquito survey of the area together with their seasonal prevalence is shown in the following table. For locality distribution see map 2.

Species	Jan.	Feb.	March	April	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
<i>Anopheles pharoensis</i> ...	—	—	—	—	33	95	90	—	37	142	140	58	595
<i>A. multicolor</i> ... ..	—	1	4	20	33	31	28	—	20	69	88	87	381
<i>A. mauritianus</i> ... ..	—	—	—	—	—	—	—	—	—	—	4	1	5
<i>Aedes caspius</i> ... ..	—	2	36	13	38	49	28	—	23	62	91	72	414
<i>Theobaldia longiareolata</i>	—	—	15	3	13	10	10	—	1	2	2	5	61
<i>Uranotactia unguiculata</i>	—	—	2	—	—	4	—	—	1	6	17	7	37
<i>Culex perexiguus</i> ... ..	—	—	—	12	23	26	45	—	25	134	147	97	509
„ <i>pipiens</i> ... ..	—	—	23	25	41	63	35	—	46	79	112	85	509
„ <i>laurenti</i> ... ..	—	—	—	2	24	59	35	—	16	77	91	33	337
„ <i>pusillus</i> ... ..	—	—	—	3	8	8	3	—	1	7	22	28	80
„ <i>quasigelidus</i> ... ..	—	—	—	—	1	6	3	—	2	1	3	—	16
„ <i>tipuliformis</i> ... ..	—	—	—	—	2	7	—	—	—	—	—	—	9
„ <i>Laticinctus</i> ... ..	—	—	—	—	2	2	—	—	—	1	1	—	6

From the above table the following conclusions may be drawn:—

(1) The prevalent anopheline mosquito larvae in the area are *A. pharoensis* and *A. multicolor*.

(2) The prevalent culicines are *Culex perexiguus*, *C. pipiens* and *C. laurenti*. The main breeding places of *Anopheles pharoensis* are rice fields and burrow-pits in which there is an abundant growth of weeds. In one instance it was found in a shallow sakia in which there was an abundant growth of vegetation. The breeding season is from May to December. It is usually found in association with *Culex laurenti* and *Culex perexiguus*. It readily enters houses and bites man and is responsible for the spread of malaria in places in which rice is cultivated.

*Anopheles multicolor* : Breeds in salty birkas such as sand quarries and burrow-pits. The larvae are found all the year round but the seasonal prevalence is from May to December. It is not a common domestic mosquito and it hardly bites man.

*Anopheles mauritianus* : The larva breeds in shady stagnant drains such as Mershaka drain (see photo 5). It is usually found in association with *Culex laurenti*; on two occasions it was found breeding in rice fields.

The maximum seasonal prevalence is late in autumn. It enters tents and houses and bites man.



*Culex pipiens*: Is widely distributed in the area. It breeds all the year round in wells, burrow pits and sakias. It is a proved carrier of filaria. 82 cases of filaria have been detected during the routine blood examination at the Khanka Malaria Research Station.

#### *Anti-Mosquito Measures.*

1. Draining and filling of birkas and swamps.
2. Cutting of Weeds and Vegetations.
3. Larvicides.
4. Fish Control.

The Sanitary Engineer surveyed all the birkas in the area. Special forms have been prepared wherein all the necessary informations are tabulated. With regard to the permanent control measures recommended, it was found that 36% of the birkas could be filled; 27% could be drained and 37% of the birkas will be drained after the completion of the general drainage scheme, which is being carried out by the Irrigation Department (see graph 7).

In filling birkas the following points have been taken into consideration :—

(a) That the birka is a breeding place for Anophelines: In this respect it was found that in a good number of large stagnant and foul birkas in some villages no Anophelines were breeding; whereas some puddles, where the water is cleaner, are the favourite breeding place for anophelines.

(b) Relation of birkas to inhabited centres: It has been shown that the density of population in the area varies greatly. In this respect birkas near a densely populated village should be filled first, while others could be neglected.

(c) Value of reclaimed land: If the cost of filling is more than compensated by the value of reclaimed land, immediate steps have been taken to fill it.

#### *Drainage.*

The drainage schemes, which are under construction by the Irrigation Department, are as follows (see map 6) :—

(1) Erection of a pump at kilo 60.450 Belbeis drain to lower the water level in the vicinity of the Birka village by 1.80 metre: It was thought at first to deepen and enlarge Belbeis drain, but this scheme would have cost L.E. 100.000. It was then thought to erect

a pump at Abu-Zaabal, this however was considered to be unnecessary as the area beyond kilometre 60 is high and well drained. The final decision is to erect the pump at kilometre 60.450. The cost of this project is estimated to be L.E. 15,000 and the area served is 5,000 feddans.

(2) Construction of birka drain, which will prevent seepage water from Gabal el-Asfar sewage farm finding its way to the low-lying land of El-Birka village. This will serve 3,000 feddans and the cost is L.E. 5,000.

(3) Construction of El-Khosous drain: This will drain the birkas at Khosous and will serve 5,200 feddans. The length of the drain will be 9.5 kilometres, and the estimated cost is L.E. 16,000.

(4) Extension of the Belbeis drain, 1 kilometre towards El-Birka village and enlarging its bed. Estimated cost L.E. 8,000.

(5) Extension of the Gabal el-Asfar drain, 2 kilometres to the south. Estimated cost L.E. 1,000.

The estimated total cost of these projects is L.E. 55,000 and the area served 13,200 feddans.

It is hoped that all these projects will be finished in 1936 and thus 37 per cent of the existing birkas will be drained.

#### THE KHANKA MALARIA RESEARCH STATION

The policy of the Khanka Malaria Research Station in getting rid of its birkas favours drainage, whenever possible, to filling, for the following reasons:—

(1) The cost of drainage is less than that of filling in many instances owing to the presence of two important drains in the area.

(2) Drainage greatly improves the value of the land. An example of this is the land of El-Birka, which is water logged and barren, but will be transformed into agricultural land when the drainage project is completed.

(3) In the western flat part of the area it is difficult to get the earth to fill the birkas in the villages.

(4) Drained birkas will not be affected by any subsequent rise of the water level of Ismailia in future, whereas filled birkas may be affected if no provision is made to fill them sufficiently.



FILLING OPERATIONS UNDERTAKEN BY THE KHANKA MALARIA STATION

I.—An area of 59,079 square metres has been filled by the labour corps of the Station as is detailed in the following table

Town or Village	Kind of Breeding Place	Site	Owner	Area
				SQ. M.
Abu-Zaabal ... ..	Pond.	Facing Abu-Zaabal Prison.	Government	16,800
	Railway Pits.	West of Railways near Abu-Zaabal Prison.		212
	Part of a Pond.	East of Abu-Zaabal Prison.		600
	Pond.	North of Trains Workshop.		1,500
	"	East of the Dwellings of the Workshop Labourers.		200
	Railway pits. Pits.	By the Sides of the Railway.		35
		North of Arab Gohina.		200
		West of the House of the Omda of Abu-Zaabal.		350
		South of Khanka and North-west of the Market.		10,500
	"	South-east of Khanka and North of the Tombs		875
El-Khanka ... ..	"	East of Khanka and West of the Railway ...	Government	18
	"	" " " " " "		30
	"	South of Khanka and North-west of the Market.		10,500
	"	El-Bondira, South of Khanka.		50
	"	The Tombs (Burial Ground) and 4 Sakias		160
	4 Sakias.	Khanka.		350
	Well.	El-Khanka.		100
	Railway Pits. Pits.	El-Khanka—Way to Abu-Zaabal.		180
		" " " "		56
	"	South of Alag.		1,055
El-Alag ... ..	"	"	Different Persons.	
	"	"	Government.	
El-Marg ... ..	"	"	Abdel-Meguid Shukshuk.	
	"	"	Government.	525
	"	"	Government.	4,200
				15

Khosous	...	...	...	...	5 Pits.	South of the Tombs.	Government.	100
					Pits.	North of Birka.		8,400
El-Birka	...	...	...	...	"	Near the Tombs.	"	40
					"	North-west of Birka.	Government,	200
					"	North of Birka.	Wakfs.	600
					"	East of Tombs.		175
Sariakous	...	...	...	...	"	Round the Tombs.		200
					"	" " "	Government.	150
Kafr el-Shourafa	...	...	...	...	Some Pits.	Houd el-Gorn.		2,100
Kafr Ebian	...	...	...	...	4 Pits.	North of Tombs.		25
								59,079



FILLING OPERATIONS UNDERTAKEN BY THE KHANKA MALARIA STATION

II.—An area of 32,607 square metres has been filled by the owners of the land at the request of the Station as shown in the following table

Town or Village	Kind of Breeding Place	Site	Owner	Area Sq. m.
Abu-Zaabal ... ..	Birka. Pits.	West of Ezbet El-Raml. In a Birka, North of the Prison. North of Akrasha.	M. Sorsok. A. Abd-el-Kerim. Moh. Wanas.	700 4,200 700
El-Khanka ... ..	Part of a Pond. Pits.	North-west of Khanka. Way to Abu-Zaabal.	Ismail Farghaly & Oth. El Habashy.	900 50
Gebel el-Asfar ... ..	Palm-trees Pits. Pakaport. 4 Pits. 5 Pits.	In the Farm. West of Ezbet El Saaïda. East of Alag.	The Farm. "Ibr. el-Bakly. Hussein el-Bakly.	350 2 875 60
El-Alag ... ..	Part of a Pit. Pits. Drains. Sakia.	Pits of Shukshuk Hod el-Zayaty. South of Alag. South-east of Marg. West Ezba of Princess.	Hassan Shukshuk. A. el-Meguid Shukshuk Moh. Ibr. Sarba. Wakf Eisha Abd-el-Khalik.	50 180 25 10
El-Marg ... ..	2 Sakias.	Ezbet el-Barbary.	Wakf Eisha Abd-el-Khalik.	30
Khosous ... ..			Government. Zaki Emba.	350 40
El-Birka ... ..	Pond. Pit.	East of Birka (filled by the Omda). East Ezbet Badawy el-Mansy.	"Moh. Osman. Ahmed Bey Kamel. Hassan Gomaa.	40 25 100 10
Siriakous ... ..	" "	North-east Ezbet Badawy el-Mansy. South-east Ezbet Mohamed Osman.	M. Sorsok.	150
Sindiwa ... ..	Sakia. Drain.	"Mahir. East Sindiwa.	Delta Light Railways. Government.	21,000 350
El-Minaïar ... ..	Pond. Pit.	East Ezbet Sorsouk. East side of Ismailia Canal.	Mustafa Tahir.	87.5
El-Minieh ... ..	Well of a Sakia.	South Ezbet El-Sada. North of Minieh.	Shafie Abu-Dinia.	10
Kafr Ebïan... ..	Sakia.	North-west Ezbet Abu Dinia.	Hassanein Mansour.	87.5
Kafr El-Shurafa ... ..	Pits	Houd el-Gorn.		

Kafr el-Shurafa	...	Drains.	North of the Village.	Mohamed Eid Farag.	20
Kafr Hamza	...	Pits.	North and South of the Village.	Government (filled by H. Way Dept).	2,100
El-Alag	...	Pit.	West of Alag.	Mustapha Abdel-Aziz.	60
Ezbet Sorsok el-Kubra	...	Pits.	South of Taftish Sorsok.	M. Sorsok.	50
					32,607



## REMOVAL OF WEEDS AND GRASSES

The following weeds have been found in area controlled by the Khanka Malaria Research Station :—

- (1) *Potamogeton Crispus*, commonly known as هلس.
- (2) *Potamogeton pectinatus*. L., commonly known as ديل الفرس.
- (3) *Polygonum senegalense*. Meiss, commonly known as بز الكلبه.
- (4) *Cyperus alopecuroides*. Rettb., commonly known as سمار.
- (5) *Ceratophyllum demersum* L., commonly known as نخشوش الحوت.

The weeds Nos. 1 & 2 are common in Abu-Zaabal and Kafr Ebian ponds. Control of these weeds is difficult. Cutting keeps them temporarily clear, but the turions drop off very easily and begin to germinate.

*Polygonum senegalense* spreads rapidly and is difficult to uproot on account of its strong root stock.

*Cyperus alopecuroides* is found along Gabal el-Asfar drain and the birkas near the workshops of the Railways at Abu-Zaabal. The stems of this weed are used for making mats.

## FISH CONTROL

Three species of fish have been used in the control of mosquito larvae in the area, *Gambusia affinis*, *Tilapia zilli* (commonly known as Bolti) and two *clarias* species (commonly known as Karmout).

A large pond, three metres by four, has been made at the Khanka Malaria Research Station. This is used for breeding *Gambusia*.

*Clarias anguillaris* is a hardy voracious fish and has been found to be extremely useful in controlling mosquito larvae breeding in wells.

## **Irrigation Channels and Drains**



The following table gives the irrigation channels and drains which have been cleared of their weeds by the labour corps of the Station in 1934-1935 :—

Town or Village	Kind of Breeding Place	Site	Owner	Area Sq. M.
Abu-Zaabal ... ..	Railway Pits. Birka of the Market. El-Shihry's Birka. Railway Pits. Pond. Drains. Pond. Burrow Pits.	By the Sides of the Railway. East of Omda's House at Kafr Ebian. West of Abu-Zaabal. East, Carrière Station. East Dwellings of the Factories Labourers. Gebel el-Asfar Drain at Abu-Zaabal. North-west El-Khanka. Railway burrow Pits, North Khanka Station.	Government.	700 8,400 1,400 350 200 250 7,000 48
El-Khanka ... ..	Niimy Birka. Drains. Drain. " " Drains.	West Arab el-Aiaida. East the Asylum. Known by Samhanat el-Gebel. From the Farm to Belbeis Drain. South and West the Farm. South and East Main Drain.		350 175 175 1,400 500 350
Gebel-el-Asfar ... ..	" " Drains. " Pond. " " " " " " 2 Ponds. Drains. Drain Pond. Drain Pond. "	Drains at Marg. East of Khosous. North " West " South-west Khosous. West Ezbet Tanios. South of Burial Ground. North of the Village. " " Mosque Drain. Zahr el-Torba. North Ezbet Mirshak. North-east Ezebet Mirshak. East of the Village.		875 12,600 5,250 2,800 14,700 5,250 2,800 25,200 350 350 12,600 200 8,400 1,050
El-Marg ... ..	" Pond. " " " " "	Drains at Marg. East of Khosous. North " West " South-west Khosous. West Ezbet Tanios. South of Burial Ground. North of the Village.		12,600 5,250 2,800 14,700 5,250 2,800 25,200
Khosous ... ..	" Pond. " " " " "	Drains at Marg. East of Khosous. North " West " South-west Khosous. West Ezbet Tanios. South of Burial Ground. North of the Village.		12,600 5,250 2,800 14,700 5,250 2,800 25,200
El-Birka ... ..	" Pond. " " " "	Drains at Marg. East of Khosous. North " West " South-west Khosous. West Ezbet Tanios. South of Burial Ground. North of the Village.		12,600 5,250 2,800 14,700 5,250 2,800 25,200
El-Marg ... ..	" Pond. " " " "	Drains at Marg. East of Khosous. North " West " South-west Khosous. West Ezbet Tanios. South of Burial Ground. North of the Village.		12,600 5,250 2,800 14,700 5,250 2,800 25,200
Minaiar ... ..	" Pond. " " " "	Drains at Marg. East of Khosous. North " West " South-west Khosous. West Ezbet Tanios. South of Burial Ground. North of the Village.		12,600 5,250 2,800 14,700 5,250 2,800 25,200
El-Minieh ... ..	" Pond. " " " "	Drains at Marg. East of Khosous. North " West " South-west Khosous. West Ezbet Tanios. South of Burial Ground. North of the Village.		12,600 5,250 2,800 14,700 5,250 2,800 25,200

Siriakous	...	...	...	East of the Village. South-east of the Village. South of the Village. Around the Burial Ground. East of Sindiwa. In the Village.	Government. Awad Abu-Gindi.	2,800
						350
						4,200
						6,300
Sindiwa	...	...	...		Government.	6,300
Kafr Ebian	...	...	...			2,800
						151,448
						21,250 m.



The following table gives the irrigation channels and drains which have been cleared of their weeds by their owners at the request of the Station in 1934-1935 :—

Town or Village	Kind of Breeding Place	Site	Owner
Abu-Zaabal ... ..	Drains.	Ezbet Wanas.	Moh. Wanas.
{ ... ..	"	Ezbet El-Bank.	M. Sorsok.
	Drain.	South of Ezbet El-Raml.	Dief. Abd-el-Kadir.
{ ... ..	Drains.	Ezbet El-Raml and El-Bank.	M. Sorsok.
	Misqas.	Ezbet Fikry Abu Shanab.	F. Abu Shanab.
El-Khanka ... ..	"	Ezbet Foda.	Abd-el-Wahab Foda.
El-Marg ... ..	"	South-west of Marg.	Hag. Moh. Ibr. Sri.
{ ... ..	Misqa.	North-west of Princess Taftish.	Hussein Faris.
	Drains and Misqas.	Princess Taftish.	Princess Nimat.
El-Alag ... ..	Pond.	South-west Ezbet Tanios.	Gorgi Tanios.
{ ... ..	Misqas.	Ezbet Hassan Kasim.	Hassan Kasim.
	"	Ezbet El-Barbari.	Wakf Eisha Abd-el-Khalik.
{ ... ..	"	Ezbet Fatma El-Ayadi.	Fatma el-Ayadi.
	"	Ezbet Mahfouz.	Mohamed Mahfouz.
{ ... ..	"	Ezbet Nageeb Pacha.	Mustapha Bey Nageeb.
	"	East of Khosous.	Different Persons.
{ ... ..	"	East of Minaiar.	Government.
	Drains.	North-east of the Village.	Ahmed el-Dieb.
{ ... ..	Misqa.	West of Boulakia.	Asma Hanim Halim.
	"	Ezbet Ahmed Bey Kamel.	Ahmed Bey Kamel.
{ ... ..	Misqas.	Ezbet Osman Sirry.	Osman Sirry.
	"	Ezbet Yani Ritcho.	M. Yani Ritcho.
{ ... ..	"	South of the Village.	Osman el Kholy.
	Misqa.	Ezbet Sabry.	Abdel-Halim Abul-Dahab.
{ ... ..	Misqas.	Ezbet El-Princess.	Princess Nimat.
	"	Ezbet Mohamed Enba.	Moh. Enba.
Siriakous... ..	Drain.	Bilbeis Drain.	Government.

Sindiwa	...	...	...	Drains. Ayata Drain. Drains. Drains and Misqas. " Drain. Misqas. Drains.	North of Ezbet Sorsok. East of Sindiwa. North-south of Sindiwa. North-south way of Sindiwa. Ezbet Sorsok el-Kobra. North of the Village. Ezbet Konga. South of Ezbet Mikhail Ayoub.	M. Sorsok. Government. M. Sorsok. " " " Eid Farag. Asma Hanim Halim. Mikhail Ayoub.
Kafr el-Shurafa...	...	...	...			
Kafr Hamza	...	...	...			
El-Birka	...	...	...			



PLACES SUPPLIED WITH GAMBUSIA FISH IN 1934-1935

Town or Village	Kind of Breeding Place	Site	Owner
Abu-Zaabal ... ..	Pond. Railway Burrow Pits. Niimi's Birka. Pond. Well. Sakia. Burrow Pits. Small Drains. Pits. Pond.	Opposite the Prison in the East side. North-east of the Village. West of Arab el-Ayaïda. North-west of Khanka. East of Railway. North-west of Khanka. East of Khanka. Gebel el-Asfar Farm. " " South of Khosous.	Government. Different Persons. Abu Shanab. El-Sayed el-Mashtouly. Government. The Farm. Government. Amin Lotfy. Fahmy Khattab. Mohamed Khattab. Greis Nakhla. Ibrahim Ebido. Alie-el-Din. Ibrahim Ebido. El-Sit Kolhoz. Abul Nasr. Mohamad Riad. Ibrahim Bara. Mohamed Soliman. Abdalla Zoreik. El-Sayed el-Hakim. Kamil Abdel-Malak. El-Sayed el-Hakim. Different Persons. Sons of N. Ads and Mikhail Ayoub. Government.
El-Khanka ... ..			
Gebel el-Asfar ... ..			
Khosous ... ..		North of Ezbet Ibrahim Ebido. South-east of Ezbet Alie el-Din. North-west of Ezbet Ibrahim Ebido. East of Khosous. North-west of Ezbet Abul-Nasr. East of Khosous. In the Property of Ibrahim Bara. North-west of Alag. West of Alag. North-east of Minieh. South of Minieh. North of Minieh. East of Minieh. Ezbet Gorgy and Ezbet El-Gania. North of Burial Ground.	
El-Alag ... ..	Well of a Sakia. " " " " " " " " " " " " " " " " Well of a Sakia. " " " " " " Well in a Garden. Pond. 4 Sakias.		
El-Minieh ... ..			
El-Birka ... ..			
Siriakous ... ..	Pond.		

Siriakous ... ..	{	2 Ponds.	South and East of Burial Ground.	Government.
		Pond of Abu Gindi.	South-east of Village.	Awad Abu Gindi.
		Pond.	South of Siriakous.	Government.
		"	East "	El-Zeiny.
		Sakia.	South "	Abdel-Wahab Enba.
Kafr Ebian ... ..	{	"	South "	Hassan Medina.
		Birka of El-Tokaby.	South "	Government.
		Pit of el-Shaharwa.	South of the Village.	Moh. & Abdalla Shihry.
		Pond.	West of Bilbeis Drain.	Ahmed Abu Dinia and Others.
		Pit.	West of Ezbet el-Sheikh Said.	Salim Abu Drahim and Others.
Arab Ayaida ... ..	{	Pits.	North of Ezbet Abu Drahim.	Others.
		"	West of Bilbeis Drain.	El-Shihry.
		Sakia.	North-west Abu Drahim.	Abu Drahim.
		"	West of Ismailia.	Ali Abul-Kheir.
		2 Sakias.	West of Arab Ayaida.	Sayed Rabaa.
			" "	Sayed Ahmed and Others.



PLACES SUPPLIED WITH TILAPA ZILLU (BULTI) FOR DESTRUCTION OF MOSQUITO LARVAE IN 1934-1935

Town or Village	Kind of Breeding Place	Site	Owner
Abu-Zaabal	Birka of El-Shahry. Railway Burrow Pits.	West of Abu-Zaabal.	Government.
El-Khanka	Sakia. Well.	North-east of Abu-Zaabal. North-west of Khanka.	" El-Sayed el-Mashtouly. Abu Shanab (Heirs).
Siriakous	Birka (El-Zeing). Birka (Abu Medina). Sakia.	North-east of Khanka. East of Siriakous.	Government. Government.
Kafr Ebian	Birka (El-Tokabi).	" South-west of Ezbet Mohamad Khalifa. South of the Village.	Hag Hassan Abu Medina. Mohamed Khalifa (Heirs). Government.

AMOUNT OF PARIS GREEN AND MAZOUT OIL USED BY THE  
STATION IN 1934-1935

*Paris Green.*

The station used 232 kilogrammes of pure Paris green which was mixed before use with 100 times its volume of fine dust. It was used in dusting the pits and other breeding places in which Anopheline larvae were found.

Supposing that 10 grammes of the mixture are used for dusting one square metre, this amount has been used for an area of 2,320,000 square metres.

*Mazout Oil.*

The station used 2,146 kilogrammes for oiling the pits and other breeding places where the larvae of mosquitoes were found.

Supposing that 20 grammes of the oil are sufficient for an area of one square metre, this amount has been used for oiling an area of 107,300 square metres.

**B.—Work carried out inside the Station**

In 1933, the policy adopted by the Khanka Malaria Research Station was to attract as many people as possible. To attain this end, patients harbouring parasitic helminths, such as Bilharzia, Ankylostoma and Ascaris were examined and treated. The scheme proved to be very successful and the station became very popular.

In the early half of 1934, it was realised that the investigation and treatment of helminthic infections taxed the energy of the limited staff of the station. It was then thought advisable to limit helminthic investigations to malaria patients only. In the latter half of 1934 it was found that malaria was on the increase owing to the high flood of the Nile and the extension of rice cultivation in the area. In consequence, investigations were limited to malaria only. To determine the extent of malaria in the area the following plan was adopted :—

(1) Examination of all infants of the area. Notification of births are sent to the Malaria Station and all infants are examined every three months. This will give an idea of primary infections occurring in the area.

(2) Malaria and Spleen survey of all school children.

(3) Malaria Survey of the important institutions.



(4) Malaria Survey of the important villages in the area. A tent was sent to the village and the patients examined on the spot. In some cases the ezba or farm was taken as a unit and the whole inhabitants are examined. In this way it was found that chronic malaria is widespread among the inhabitants. Such patients harbour the malaria parasite and act as reservoirs of infection, though they hardly go **to the** station or seek the advice of a doctor. A plan is now being worked **out to** train five microscopists. It is hoped that a malaria survey of all the people of the area will be finished in 1936.

In 1934, 8,673 persons were examined for malaria, of which 736 were positive, *i.e.* 8·4 per cent.

The following table shows the blood films examined and the places from which they were taken or sent:

Locality	Number examined	Positive for Malaria	Percentage
			%
Patients attending the station ... ..	4,661	559	12·1
Films from contacts of malaria patients ...	1,332	36	2·7
Films sent from the tents belonging to the station... ..	421	111	26·0
Films taken from schools in the area ...	1,407	19	1·3
Films taken during malaria survey of farms	340	7	2·0
Films sent from mental hospitals and other institutions ... ..	513	4	0·7

From the above table it is evident that the percentage of positive malaria films received from the tents is high, which shows the great value of examining people on the spot, instead of waiting for patients to come to the malaria station.

The following table gives a comparison of cases examined for malaria in the last three years (*see also graph*):

Year	Number examined for Malaria	Positive for Malaria	Percentage	Remarks
			%	
1932... ..	1,684	91	5·4	—
1933... ..	4,586	316	6·8	—
1934... ..	8,674	736	8·4	High flood and extension of rice cultivation

From this table the following conclusion may be drawn. :—

(1) The number of cases examined in 1934 are about double the number examined in 1933 and 5 times the number examined in 1932.

(2) The percentage of malaria incidence in 1934 is higher than in the previous years. This is mainly due to the policy adopted by the station in examining people on the spot, whereby a large number of chronic cases were detected. The high flood in 1934 and extension of rice cultivation are also important factors.

The monthly distribution of malaria cases in the area controlled is shown in the following table (see graph 10):

Months	Number examined	B. T.		M. T.		Total of Malaria Cases	Percentage
		Number examined	Percentage	Number examined	Percentage		
			%		%		%
January ... ..	158	2	1·25	2	1·25	4	2·5
February ... ..	344	2	0·8	—	—	2	0·58
March ... ..	469	4	0·85	—	—	4	0·85
April ... ..	962	16	1·6	—	—	16	1·6
May ... ..	772	37	4·7	—	—	37	4·7
June ... ..	866	98	11·3	4	0·4	102	11·7
July ... ..	938	161	17·1	—	—	161	17·1
August ... ..	759	139	18·3	2	0·26	141	18·5
September ... ..	1,146	88	7·6	—	—	88	7·6
October ... ..	1,122	86	7·6	12	0·1	98	8·7
November ... ..	628	40	6·3	19	0·3	59	9·3
December ... ..	510	13	2·5	11	2·1	24	4·7
TOTAL ... ..	8,674	686	7·9	50	0·5	736	8·4

The following conclusion may be drawn from the above table and graph No. 10.

(1) The malarial months in the year are from June to December. The maximum incidence is in August.

(2) The incidence of malignant malaria is much less than that of benign tertian, the ratio being about 16 to 1. The seasonal incidence of malignant malaria is from October to January.



The following table shows the locality distribution of benign and malignant malaria in the area controlled by the Khanka Malaria Research Station (see map 7 and graph 12) :

Village	Number examined	B.T.		M.T.		Total Number	Percentage
		Number	Percentage	Number	Percentage		
			%		%		%
Sindiwa ... ..	704	82	11·6	14	20	96	13·6
El-Kalag... ..	551	66	11·9	3	0·54	69	12·44
Kafr Ebian ... ..	309	32	10·3	2	0·6	34	10·9
Kafr Hamza ... ..	897	90	10·0	2	0·2	92	10·2
El-Berka ... ..	63	3	4·7	3	4·7	6	9·4
Siriakos ... ..	1,283	108	9·0	6	0·39	114	9·39
El-Khosous ... ..	374	28	7·5	—	—	28	7·5
El-Marg ... ..	138	8	5·8	—	—	8	5·8
El-Menaih ... ..	38	2	5·26	—	—	2	2·26
El-Khanka ... ..	2,691	130	4·8	7	0·26	137	5·06
Abu-Zaabal ... ..	927	42	4·5	4	0·44	46	4·94
El-Manayel ... ..	362	76	4·7	—	—	76	4·7
Outside the area ... ..	337	19	0·6	9	2·8	28	2·8
Total ... ..	8,674	686	7·9	50	0·5	736	8·4

The following conclusions may be drawn from a study of the above table and graph No. 12:

(1) The malaria incidence is highest at Sindiwa, Kalag, Kafr Ebian, Kafr Hamza, El-Birka, Siriakus, El-Khosous, El-Marg, El-Minaih, El-Khanka, Abu-Zaabal and El-Manayel in the order mentioned. The main factor responsible for the increased incidence of malaria in the first five villages is the introduction or extension of rice cultivation in the neighbourhood of these villages.

(2) The incidence of malignant malaria is highest at El-Birka and Sindiwa village. It was also high in patients who came from outside the area controlled by the Khanka Malaria Research Station.

(3) An indefinite correlation could be made between the malaria incidence and the mosquito survey. Rice fields and drains are the main breeding places for *Anopheles pharoensis*. Extension of rice cultivation would be responsible for the increase of the Anopheline factor, namely *Anopheles pharoensis*.

The age distribution of the 736 positive malaria cases is as follows:

Age	Number	Percentage
		%
Less than 2 years ... ..	33	4.4
2-10 years ... ..	206	27.9
10-20 years ... ..	148	20.0
Over 20 years ... ..	349	47.7

The study of the age distribution shows that children are less affected by malaria than adults and men. This is an indication of the chronicity of malaria in the area <sup>(1)</sup>.

#### FILARIA INCIDENCE IN THE AREA CONTROLLED BY THE KHANKA MALARIA RESEARCH STATION

During the routine blood film examination for malaria which is taken in day-time, 88 cases of filaria were detected in the period from June to October 1934. The filaria incidence would have been much higher if the blood films were taken at night. It is hoped to extend the investigation on the prevalence of filaria in the area in 1935.

The monthly distribution of the above-mentioned cases is as follows:

Month	Films examined	Positive for Filaria	Percentage
			%
June ... ..	854	14	1.6
July ... ..	912	17	1.8
August ... ..	742	23	3.0
September ... ..	1,933	29	2.5
October ... ..	1,000	5	0.5
<b>TOTAL ... ..</b>	<b>5,641</b>	<b>88</b>	<b>1.5</b>

<sup>(1)</sup> This statement is given with some reserve, as detailed study of the subject will appear in 1935 report.



The locality distribution of filaria cases in the area is as follows (See graph 13 A):

Village	Films examined	Positive for Filaria	Percentage
			%
Kafr Ebian ... ..	234	9	3·8
El-Kalag ... ..	387	9	2·3
Siriakos ... ..	614	13	2·1
El-Khanka ... ..	1,725	33	1·9
El-Manail ... ..	245	4	1·6
Sindiwa ... ..	332	4	1·2
Kafr Hamza ... ..	495	5	1·0
Abu-Zaabal ... ..	391	4	1·0
El-Khosous... ..	153	1	0·6
From outside the area	65	6	9·2

The above table shows that filaria is widely distributed in the area. The high incidence of filaria (9·2) in films sent from outside is noteworthy.

### HELMINTHIC INFECTIONS

4,170 patients were examined, in 1934, for helminthic infections.

The number of patients free from such infections was 592, the remainder showed the presence of one or more parasites.

The following table gives the incidence of the various helminthic infections calculated on the basis of the number of infections <sup>(1)</sup> (see also graph 13 B) :

Disease	Number of Infections	Percentage
		%
Bilharzia, urinary and intestinal, 1,462+94 ... ..	1,556	51·0
Ancylostoma ... ..	1,495	49·0
Ascaris ... ..	1,048	34·0
Other helminths ... ..	558	18·0

<sup>(1)</sup> The number of infections differs from the number of patients as one patient may harbour more than one parasite.

From this table and graph, the following conclusions may be drawn:—

(1) The most prevalent helminthic infections in the area are Bilharzia, Ancylostoma and Ascaris in the order mentioned.

(2) Urinary Bilharzia is commoner than intestinal Bilharzia, the ratio being 20 to 1.

#### RESEARCH PROBLEMS

##### 1. *Biology and Morphology of the Immature Stages of Egyptian Anophelines and Aedes aegypti.*

The biology and morphology of the immature stages of *Aedes aegypti* and *Anopheles pharoensis* have been completed. It is hoped to extend this investigation during 1935 to *A. multicolor*, *A. mauritanus* and *A. sergenti*. It is of interest to note the change of chaetotaxy in the 4 larval instars.

##### 2. *Mosquito Dissection.*

800 mosquitoes were sent to the Research Institute from the Khanka and Edkou Malaria Stations, for identification and dissection. The species collected were as follows:

*Anopheles pharoensis* 750, *Anopheles mauritanus* 35, *Anopheles muticolor* 15.

Only 120 mosquitoes were fit for dissection. In a batch of 35 *Anopheles pharoensis* sent from Edkou, two showed the presence of small malaria oocysts in the stomach.

##### 3. *Artificial Infection of Mosquitoes with Malaria Parasites.*

A batch of 25 *Anopheles pharoensis* were allowed to bite 2 patients whose blood showed the presence of numerous Gametocytes. The mosquitoes were given three feeds and then put in a constant temperature incubator at 22° C. Most of the mosquitoes died during the first week and only 5 survived up to 18 days. On dissection 2 mosquitoes showed oocysts in their alimentary canal. This work is still going on.

##### 4. *Relation of Rice Cultivation to the Spread of Malaria in Egypt.*

The preliminary investigation of the mosquito fauna of rice fields in Lower Egypt has been worked out in 1933. This work is being extended to the area controlled by the Khanka Malaria Research Station. Investigation of the extent of rice cultivation, fauna, salinity and Ph of rice field water is under study.



5. *Collective Prophylaxis of Malaria by Anti-Malarial Drugs.*

On the recommendation of the Entomology Section the following experiments were carried out under the supervision of Dr. Soubki, the Resident Medical Officer of the Khanka Malaria Research Station.

Six ezbas in different villages have been selected. All inhabitants were examined for malaria and positive cases were treated by various drugs till cured.

Quinine, Plasmochine, Atebrin and other compounds are given weekly for prophylaxis during the malaria season. Two ezbas are kept as control and no prophylactic drugs are given. This work is still going on.

*Subsoil Water.*—The Sanitary Engineer is making some observations on the fluctuation of subsoil water in some wells in the area.

## I.—Introduction

## CLINICAL INVESTIGATION DURING THE YEAR 1934

As a result of applying constant routine examinations and investigations to every patient in the Out-patient Department (as shown in the following card), it was possible to detect a large variety of diseases :—

# Front

## Research Institute and Endemic Diseases Hospital

Serial No. _____		Date _____	
Name of Patient _____		Age _____	Sex _____ Destination _____
Clinical Examination	{	Temp. _____	Pulse _____
		Heart _____	
		Liver _____	Spleen _____
Blood Exam.	Hb. _____	Parasites _____	
Urine :	Blood _____ Pus _____	Casts _____	Ova _____
Faeces :	Character _____ Blood _____	Mucus _____	
	Helminth ova _____	Worms _____	
	Protozoa _____		
Other Investigations _____			

## Back

Diagnosis\_\_\_\_\_ Weight\_\_\_\_\_kilo

[illegible]

## Result

## Result



The following diseases were found and are systematically arranged in the following table :—

Disease	Number	Remarks
<i>Circulatory System</i>		
Double mitral ... ..	41	{ 5 with heart failure, 2 W.R. positive.
Mitral insufficiency (organic) ... ..	11	—
Pulmonary dilatation with double mitral	5	—
Mitral stenosis ... ..	24	—
Aortic regurgitation (rheumatic) ... ..	4	{ 1 with mitral stenosis. 1 with double mitral.
Aortic syphilis ... ..	13	—
Atheromatous aorta ... ..	4	With hypertensive myocardosis.
Bradycardia ... ..	4	Sinus bradycardia.
Tachycardia ... ..	15	—
Extracystoles ... ..	8	—
Pulsus bigeminus ... ..	1	—
Arteriosclerotic myocardosis ... ..	1	—
Thyreotoxic heart ... ..	11	—
Neuro-circulatory asthemia ... ..	2	—
Hypertensive heart ... ..	8	W.R. negative, albumin negative.
Heart failure ... ..	4	Chronic bronchitis, emphysema.
Acroparaesthesia ... ..	1	—
Vascular claudication ... ..	1	—
<i>Respiratory System</i>		
Chest deformities ... ..	5	2 scoliosis.
Acute bronchitis ... ..	43	—
Chronic bronchitis ... ..	12	—
Asthmatic bronchitis ... ..	14	—
Asthma ... ..	3	—
Chronic bronchitis with emphysema ...	14	—
Emphysema ... ..	9	—
Bronchiectasis ... ..	3	—
Fibrosis of lung ... ..	2	—
Hypertrophic pulmonary osteo-arthro- pathy ... ..	1	—
Pulmonary tuberculosis ... ..	20	—
Pneumonia (basal) ... ..	6	2 bilateral.
Confluent broncho-pneumonia ... ..	5	—
Dry pleurisy ... ..	1	—
„ chronic ... ..	3	—
„ basal ... ..	2	—
„ diaphragmatic ... ..	1	—
Pleural effusion... ..	2	—
Left hydro-pneumothorax ... ..	2	—
? Lung bilharziasis ... ..	1	T.B. negative, X-ray infiltration, eosinophilia.

Disease	Number	Remarks
<i>Nervous System</i>		
Trigeminal lesion (traumatic) ... ..	1	—
Left 6th nerve paralysis (syphilitic) ...	1	—
Right facial paralysis (Bell's) ... ..	4	—
Right facial spasm ... ..	1	—
Thrombotic hemiplegia ... ..	13	3 W. R. positive.
Paralysis agitans ... ..	2	—
Post-encephalitic Parkinsonism ... ..	6	—
Congenital athetosis (agenetic) ... ..	1	W. R. negative.
Catalepsy ... ..	1	—
G.P.I. ... ..	2	W. R. positive, C. S. F. positive.
Migraine ... ..	1	—
Neurasthenia ... ..	1	—
Hysteria ... ..	1	—
Cerebellar tumour ... ..	1	W. R. negative.
Cerebellar degeneration (arteriosclerotic)		W. R. negative.
Anterior polyomyelitis ... ..	1	—
Post-stovaine trauma ... ..	1	—
Tabes dorsalis ... ..	1	—
Lateral sclerosis (pellagrous) ... ..	3	—
Subacute combined degeneration (pellagrous) ... ..	7	—
Amyotrophic lateral sclerosis ... ..	1	W. R. negative.
Radiculitis ... ..	4	—
Left sciatica ... ..	2	—
Spondylitis deformans ... ..	2	—
Tetanus ... ..	1	—
Recklinghausen's disease ... ..	1	—
<i>Gastro-Intestinal Tract</i>		
Dysphagia ... ..	1	P. V. syndrome.
Peptic ulcer ... ..	2	—
Aerophagia ... ..	1	—
Gastritis } Hyperchlorhydric ... ..	3	—
Gastritis } Achlorhydric ... ..	2	—
Acute appendix ... ..	4	—
Chronic appendix ... ..	12	—
T.B. peritonitis ... ..	9	—
T.B. enteritis ... ..	2	With pulmonary T.B.
Ileo-psoas abscess ... ..	1	
Cholecystitis ... ..	11	{ 1 post-typhoid, 3 stones, 3 X-ray negative.



Disease	Number	Remarks
Dysentery— total ... ..	229	—
Of these :—		
<i>Entamoeba hystolitica</i> + ... ..	43	—
<i>Schistosoma</i> + ... ..	34	—
<i>Bacillus dysenteriae</i> (Flexner) + ...	3	—
Flagellates + ... ..	5	—
Other cases ... ..	144	—
Catarrhal colitis (sigmoidoscopy) ... ..	21	—
Carcinoma of rectum ... ..	2	—
Jaundice ... ..	39	Obstructive 3, of these 2 stones, 1 Carcinoma of pancreas ; he- patic 36.
Hepatosplenomegaly ... ..	238	—
Hepatomegaly ... ..	293	—
Splenic enlargement ... ..	164	—
Cirrhosis of liver with ascites ... ..	10	—
Splenectomy ... ..	2	—
<i>Genito-Urinary System</i>		
Movable kidney ... ..	2	—
Hydronephrosis ... ..	3	—
Pyonephrosis ... ..	3	—
Renal colic { ( <i>Bilharzia</i> + ... ..	26	—
,, — ... ..	29	—
Acute ... ..	2	—
Nephritis { Subacute ... ..	9	—
Nephrotic syndrome ... ..	1	—
Chronic glomerulo-nephritis ... ..	14	—
Pyelitis ... ..	45	—
Stone of bladder ... ..	3	—
Carcinoma of bladder ... ..	2	—
Incontinence of urine ... ..	51	—
Enlarged prostate ... ..	26	—
Hydrocele ... ..	7	2 <i>Filaria</i> positive.
<i>Bilharzia</i> of seminal vesicles ... ..	4	—
Funiculitis ... ..	1	—
<i>Bilharzia</i> of penis ... ..	1	—
Chyluria ... ..	3	—
Uterine tumour ... ..	1	—
Salpingo-ovaritis ... ..	2	—
<i>Endocrine Diseases</i>		
Dwarfism ... ..	1	—
Froehlich's syndrome ... ..	4	—

Disease						Number	Remarks
Lorain infantilism	...	...	...	...	...	1	—
Diabetes insipidus	...	...	...	...	...	3	—
Adipos. dolor.	...	...	...	...	...	1	—
Thyreo-toxicosis	...	...	...	...	...	9	—
Hypertrichosis	...	...	...	...	...	1	—
Adenomatous goitre	...	...	...	...	...	17	—
Acromegaly	...	...	...	...	...	1	—
<i>Fevers (Positive Widal)</i>	{	Typhoid	...	...	...	126	—
		Paratyphoid	A.	...	...	30	—
		Paratyphoid	B.	...	...	45	—
		Mixed	...	...	...	17	—
<i>Malaria</i>	{	Benign tertian	...	...	...	14	—
		Malignant tertian	...	...	...	10	—
Whooping Cough	...	...	...	...	...	1	—
Follicular tonsilitis	...	...	...	...	...	7	Diphtheria negative.
Mumps	...	...	...	...	...	1	—
Syphilis — total	...	...	...	...	...	34	—
„ Chancre	...	...	...	...	...	2	—
„ Secondary syphilis	...	...	...	...	...	2	—
„ Tertiary syphilis	...	...	...	...	...	26	—
„ Congenital	...	...	...	...	...	4	—
Gonorrhoea	{	Acute	...	...	...	5	—
		Chronic	...	...	...	25	—
Elephantiasis	...	...	...	...	...	7	—
<i>Skin Diseases</i>	...	...	...	...	...	102	80 scabies.
Oriental Sore	...	...	...	...	...	13	—
Leprosy	...	...	...	...	...	2	—
Rhino-scleroma	...	...	...	...	...	1	—
Pott's disease	...	...	...	...	...	1	—

## II.—The Result of the Work of the Out-patient Clinic

### A.—EXAMINATION OF CASES

Patients attending the out-patients are subjected to the following examinations :—

- (1) Clinical examination.
- (2) Urine for schistosomiasis, blood & pus.
- (3) Stools for helminth ova & protozoa.
- (4) Further examinations as conditions require.



(a) Haematological :—

Blood film, total & differential counts, Hb., W.R., Widal, blood culture.

(b) Urine, albumin, sugar & casts.

(c) Rectal & sigmoidoscopic examination.

(d) Cystoscopic examination.

(e) For X-ray, patients are referred to Kasr el-Aini Hospital.

B.—INCIDENCE OF PARASITIC INFECTIONS

The total number of new cases dealt with during the year 1934 was 11,784.

The microscopic examinations of their urine & stools revealed the following :—

TABLE. 1

Nature of Cases	Number	Percentage
Total number of urines examined ... ..	11,635	—
<i>Schistosoma haematobium</i> ova in urine ... ..	5,320	45·7
<i>Schistosoma mansoni</i> ova in urine ... ..	—	—
Total number of stools examined ... ..	11506	—
<i>Schistosoma haematobium</i> ova in stools ... ..	147	1·5
<i>Schistosoma mansoni</i> ova in stools ... ..	274	2·3
<i>Ancylostoma duodenale</i> ova ... ..	3,249	28·2
<i>Ascaris lumbricoides</i> ova... ..	1,944	16·8
<i>Taenia saginata</i> ova ... ..	82	0·7
<i>Enterobius vermicularis</i> ova ... ..	474	4·1
<i>Trichostrongylus</i> ova ... ..	1,485	12·8
<i>Hymenolepis nana</i> ova ... ..	513	4·5
<i>Hymenolepis diminuta</i> ova ... ..	2	—
<i>Trichocephalus trichuris</i> ova ... ..	127	1·1
<i>Strongyloides stercoralis</i> larvae ... ..	17	0·15
<i>Heterophyes heterophyes</i> ova ... ..	4	0·03
Total number of cases negative for helminth ova ...	5,534	48·09

The stools are examined by the smear method and also by Khalil's Erlenmeyer flask-floatation method. The swab method is used in doubtful negative cases.

### C.—RESULTS OF TREATMENT OF SCHISTOSOMIASIS

Fouadîn was the drug used for the routine treatment of Schistosomiasis. The dose is given in proportion to the weight of the patient. The adult (60 kilos) receives 3·5 c.c. intramuscularly as a first dose, then 5 c.c. each following dose up till 9 injections. Re-examination of the urine and stools is made after the last injection. Additional injections are given if living ova persist. Patients are requested to return for re-examination after 1, 2 and 3 months.

The general results of the treatment of urinary and intestinal Schistosomiasis are seen in the following:—

TABLE 2

Nature of cases	Number	Percentage
Number of patients who completed the course of 9 injections ... ..	2,479	---
Total number cured ... ..	1,917	77·3
Number cured after 9 injections ... ..	1,267	51·0
„ „ „ 11 „ ... ..	486	19·7
„ „ „ 13 „ ... ..	164	6·6
Number of patients who did not continue with the additional injections ... ..	562	
Number of cases still positive after the thirteenth injection ... ..	114	4·5

*Re-examination* was possible after 1 month in 272 cases.

The result was that 239 were cured, *i.e.* 87·9 per cent, and 33 were still positive, *i.e.* 12·1 per cent.

*Re-examination* after 2 months was possible in 67 cases.

55 were cured, *i.e.* 82 per cent and 12 were positive, *i.e.* 18 per cent

### D.—RESULTS OF TREATMENT OF THE TWO SPECIES OF SCHISTOSOMA (HAEMATOBIMUM AND MANSONI) INFECTING EITHER THE URINARY OR INTESTINAL TRACTS

Table No. 3 shows the distribution of infection with the two species of Bilharzia in the urinary and intestinal tracts and the result of their treatment with Fouadîn (*See table, next page*).



TABLE 3. — SHOWING INFECTION  
RESULTS OF TREATMENT

Schistosomiasis Infection	Total Number of Patients	Untreated Patients	Treatment incomplete
<i>Sch. haematobium</i> in urine only ... ..	5,122 —	1,439 —	1,429 —
<i>Sch. haematobium</i> in urine and stools ... ..	137	28	39
<i>Sch. haematobium</i> in urine and <i>Sch. mansoni</i> in stools ...	128	40	31
Negative urine and <i>Sch. mansoni</i> in stools only ... ..	121	38	25
Negative urine <i>Sch. haematobium</i> in stools only ... ..	34	14	4
<i>Sch. haematobium</i> and <i>Sch. mansoni</i> in urine and <i>Sch.</i> <i>mansoni</i> in stools ... ..	10	—	2
Negative urine, <i>Sch. haematobium</i> and <i>Sch. mansoni</i> in stools ... ..	2	1	—
<i>Sch. haematobium</i> and <i>Sch. mansoni</i> in urine and negative stools ... ..	31	12	5
<i>Sch. haematobium</i> in urine, <i>Sch. haematobium</i> and <i>Sch.</i> <i>mansoni</i> in stools ... ..	5	2	3
<i>Sch. mansoni</i> in urine only, stools negative ... ..	4	4	—
<i>Sch. mansoni</i> in urine and <i>Sch. mansoni</i> in stools ... ..	1	—	—
TOTAL ... ..	5,595 —	1,578 —	1,538 —

WITH BILHARZIASIS AND THE  
BY FOUADIN DURING 1934

Total	Results of Treatment						Re-examination					
	Cured			Uncured			After 1 Month			After 2 Months		
	after 9 inj.	after 11 inj.	after 13 inj.	after 9 inj.	after 11 inj.	after 13 inj.	Total	—	+	Total	—	+
2,254	1,201	423	137	249	144	100	261	230	31	64	53	11
—	53·2	18·7	6·07	11·0	6·4	4·4	—	—	—	—	—	—
70	13	19	10	18	4	6	4	2	2	1	1	—
57	13	19	7	8	4	6	4	4	—	2	1	1
58	23	14	6	11	3	1	3	3	—	—	—	—
16	9	3	—	3	1	—	—	—	—	—	—	—
8	1	5	1	1	—	—	—	—	—	—	—	—
1	—	—	—	—	—	1	—	—	—	—	—	—
14	7	3	2	1	1	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
1	—	—	1	—	—	—	—	—	—	—	—	—
2,479	1,267	486	164	291	157	114	272	239	33	67	55	12
—	51·0	19·7	6·6	11·7	6·3	4·5	—	—	—	—	—	—



E.—SYMPTOMS DEVELOPING DURING THE TREATMENT

	Cases
Vomiting usually after 5 to 8 injections occurred in	30
Giddiness usually after 8 injections occurred in ...	30
Tachycardia, usually after 6 to 8 injections occurred in	13
Dyspnoea with palpitation after 8 injections occurred in	1
Rise of temperature (mostly due to intercurrent infections) in ... ..	19
Retrosternal pain after the fifth injection in ... ..	2
Pyodermia (gluteal region) in ... ..	1
Urticaria in ... ..	1
Renal colic in ... ..	2
Jaundice 20 days after the course, unrelated to injections ... ..	1

F.—TREATMENT OF ANCYLOSTOMIASIS

*Drug used* : Carbon tetrachloride.

*Dose* : 5 c.c. to the adult, according to weight, with 90 c.c. of solution of magnesium sulphate.

Movement of bowel is ascertained within 2-3 hours, otherwise an enema is given.

*Diet* : Instructions are given that patients ought to come fasting on the morning of treatment.

Re-examination is made after a week's interval and treatment repeated if necessary.

G.—RESULTS OF TREATMENT

TABLE 4.

Nature of Cases	Number	Percentage
Total number of patients examined ... ..	1,043	—
Cured after 1st dose ... ..	521	49·3
„ „ 2nd dose ... ..	147	14
„ „ three or more doses ... ..	31	2·9
Total, cured ... ..	699	67
Number of those who received one or more doses and did not continue till cured ... ..	344	33
Others received drug but did not apply for examination ... ..	798	—
Those who were examined but did not apply for treatment ... ..	557	—
Total of all infected persons examined, including treated and untreated ... ..	2,398	—

## REMOTE RESULTS OF THE TREATMENT

Re-examination was possible in 60 cases after 1 month; 48 cases were found to be still negative, *i.e.* 80 per cent. 6 cases presented themselves for re-examination after two months and all were negative.

### H.—SYMPTOMS APPEARING DURING TREATMENT

- (1) Giddiness in 30 cases, usually relieved by soap enemas.
- (2) Vomiting in 10 cases, usually due to patients not strictly fasting.
- (3) Bradycardia in 15 cases, restored after soap enemas and a stimulant such as caffeine.
- (4) Fainting in 2 cases; patients recovered after a little time of syncope and the condition was relieved with enemas and stimulants.

### I.—TREATMENT OF ANCYLOSTOMA AND ASCARIS INFECTIONS WITH A MIXTURE OF C.T.C. AND OIL OF CHENOPODIUM

Equal parts (2·25 c.c.) of each used as a dose for the adult.

*Results* show that the Ascaris was greatly affected while the Ancylostoma to a lesser degree and the patient received another dose of carbon tetrachloride to kill the persisting Ancylostoma worms.

Total number of cases examined and treated ...	374	%
Total of cases cured of both parasites ...	144	38·5

#### *Total of cases cured of Ascaris but not of Ancylostoma:*

After first dose ...	187	50·0
„ second dose ...	36	9·6

#### *Total cases positive for both parasites:*

After first dose ...	7	1·87
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### J.—TREATMENT OF ASCARIS INFECTION

#### 1. *Ascaridol:*

Ascaridol was given in 1·25 c.c. adult dose with castor oil 40 grammes to 280 cases.

Number of cases cured ...	271	%
„ of positive cases ...	9	3·2



## 2. Oil of *Chenopodium*:

In doses of 2·5 c.c. to the adult with 40 grammes castor oil was given to 267 cases.

		%
Number of cured cases	... .. 245	91·7
„ „ positive cases	... .. 22	8·3

## K.—TREATMENT OF ENTEROBIUS VERMICULARIS INFECTION

Carbon tetrachloride was used as in treating *Ancylostoma* infection.

		%
Number of cases examined and treated	... .. 262	—
„ cured after first purge	... .. 213	81·2
„ „ „ second purge	... .. 1	0·4
„ of positive cases after first purge	... .. 47	17·9
„ „ „ „ „ second purge	... .. 1	0·4

## L.—TREATMENT OF TAENIA SAGINATA INFECTION

Extract of *Filix mas* was used. Difficulty in obtaining the fresh extract stood against extending its use.

		%
Cases found positive for <i>Taenia saginata</i>	... .. 82	—
„ that did not apply for treatment	... .. 22	—
„ treated but did not apply for re-examination	15	—
Total of cases examined and treated	... .. 35	—
„ „ cured	... .. 26	74·3
Found positive after one month	... .. 9	25·7

## M.—HYMENOLEPIS NANA INFECTION

Total number of cases found positive	... .. 515
Cases examined and treated	... .. 25
„ cured after one dose of male fern extract	10
„ still positive	... .. 15

### N.—HYMENOLEPIS DIMINUTA INFECTION

Two cases were met with in the out-patient clinic and diagnosed by the characteristic form and size of the ova. Both cases were admitted into hospital and treated by felix mas. One case yielded four worms complete with the head. The second case yielded three complete worms and several incomplete bodies. Details will be published later.

### O.—HETEROPHYES HETEROPHYES

Patients suffering from this parasite do not usually give any complaints. Heavy infections however, cause colic and intermittent diarrhoea which may lead to severe neurasthenia.

In such cases, treatment with extract of felix mas results in great improvement. The patients are treated on the same lines as for *Taenia saginata*.

In the four cases treated, huge numbers of the trematodes were expelled and immense relief of the symptoms followed.

### P.—TREATMENT OF OTHER PARASITIC INFECTIONS

Cases of pure infections of the minor parasites, *e.g.* Trichostrongylus, Trichocephalus and Strongyloides were treated with carbon tetrachloride on the same lines as in ancylostomiasis.

TABLE 5.—STATISTICS OF THE WORK DONE IN THE OUT-PATIENTS,  
NEW PATIENTS ATTENDING DURING 1934 PER MONTH

Month	Females under 12 Years	Females over 12 Years	Males under 12 Years	Males over 12 Years	Total
January ... ..	17	115	59	314	505
February ... ..	51	196	61	423	731
March ... ..	60	211	59	427	757
April ... ..	98	212	102	668	1,080
May ... ..	97	319	130	669	1,215
June ... ..	73	284	122	601	1,080
July ... ..	88	253	143	731	1,215
August ... ..	64	337	78	646	1,125
September ... ..	63	306	109	692	1,170
October ... ..	96	323	102	649	1,170
November ... ..	90	315	94	606	1,105
December ... ..	40	141	82	368	631
TOTAL ... ..	837	3,012	1,141	6,794	11,784



NUMBER OF TREATMENTS OF PATIENTS DURING 1934 PER MONTH

Month	Fouadin Injections for Bilharzia			Doses of C. T. C. for Ancylostoma			Doses of Oil of Chenopodium for Ascariis			Doses of a Mixture of C. T. C. and O. C. for Ancyl. and Ascaris			Doses of Filix Mas for Taenia Saginata			Emetine Injections for Amoebic Dysentery			Injections of Cylotropin for Post-Bilharzial Cystitis		
	New	Old	Total	New	Old	Total	New	Old	Total	New	Old	Total	New	Old	Total	New	Old	Total	New	Old	Total
January ...	289	1,983	2,272	94	47	141	37	2	39	39	—	39	—	—	—	—	—	—	—	—	9
February...	346	2,406	2,752	134	79	213	52	1	53	29	2	31	—	—	—	—	—	—	—	—	25
March ...	256	2,055	2,311	108	55	163	43	3	46	36	2	38	7	—	7	1	5	6	—	—	26
April ...	411	2,325	2,736	189	43	232	108	1	109	69	—	69	3	—	3	—	—	—	—	—	34
May ...	385	3,184	3,569	293	107	400	81	—	81	68	1	69	5	1	6	—	—	—	—	—	—
June...	373	2,644	3,017	215	83	298	84	2	86	57	2	59	5	1	6	—	—	—	—	—	—
July...	441	3,296	3,737	260	104	364	81	2	83	60	2	62	8	—	8	—	—	—	—	—	—
August ...	394	2,784	3,178	190	79	269	75	2	77	46	1	65	7	—	7	—	—	—	—	—	—
September	398	3,136	3,534	184	58	242	96	4	100	73	1	74	13	1	14	—	—	—	—	—	—
October ...	339	2,407	2,746	197	62	259	81	1	82	49	—	49	6	—	6	—	—	—	—	—	—
November	382	2,534	2,916	151	48	199	100	4	104	64	—	64	7	—	7	—	—	—	—	—	—
December	243	2,358	2,601	90	52	142	61	2	63	27	1	28	7	1	8	21	113	134	—	—	—
TOTAL ...	4,257	31,112	35,369	2,105	817	2,922	899	24	923	635	12	647	68	4	72	22	118	140	—	—	94

### III.—The Hospital In-patients

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#### A.—ANAEMIAS

Investigations on anaemias in Egypt are being continued. Special attention was given to the following points :—

#### *Mechanism of Production of Helminthic Anaemias.*

The great similarity of the haematological, biochemical and clinical findings in helminthic anaemias of various causations suggests a similar mechanism of production. The ways in which helminthic infection can give rise to anaemia are :—

(1) Haemorrhage.

(2) Toxins                    { (a) Producing haemolysis.  
                                  { (b) Depressing the bone-marrow.

(3) Nutritional deficiency of certain haemopoietic substances.

#### 1. *Haemorrhage.*

In the present study occult blood was found in nearly every case, suggesting that haemorrhage plays a part in the production of the anaemia.

Analysis of 22 cases of ancylostomiasis (previous report) as to the relationship of the number of worms harboured to the degree of anaemia has shown that there is no such relation. Accordingly, haemorrhage cannot be the sole cause of the anaemia. In bilharzial anaemia, a similar conclusion could be reached by comparing the degree of anaemia in urinary and intestinal bilharziasis. Haemorrhage is more frequent and abundant in the former, while the anaemia is milder. This suggests that the anaemia is related more to the type of lesion and the complications produced than to the actual loss of blood.

#### 2. *Toxins.*

(a) The absence of evidence of haemolysis in ancylostomiasis and in intestinal Bilharzia anaemia has already been mentioned in the haematological studies of these cases (previous report). The organs of patients who had died from ancylostoma anaemia, as well as those of dogs with experimental ancylostoma anaemia, showed no evidence of haemosiderosis.



(b) As to the possibility of toxic depression of the bone-marrow the following observations suggest its existence, although it is of minor significance :—

- (i) In the presence of worms, the anaemia could be improved by iron but only to a certain point. In some of these cases a further improvement occurs after the expulsion of the worms without the administration of any more iron. The presence of the worms apparently hinders the utilisation of the stored iron beyond a certain degree.
- (ii) The reticulocytic response to iron given in the presence of worm is lower, more delayed and flatter than that following iron given after the expulsion of the worms.
- (iii) The anaemia and eosinophilia of the invasion stage of ancylostomiasis, described by Ashford and observed by us in two cases, is certainly in favour of the toxic element.

### 3. *Nutritional Deficiency.*

Following the development of the ancylostoma anaemia in two patients with nearly the same degree of infection, it was noticed that the anaemia developed quicker (15 per cent Hb. after 4 months) on a poor diet than on a rich diet (40 per cent Hb. after 7 months). This observation has shown the significance of nutritional deficiency in the development of this anaemia. Accordingly, experiments on dogs were carried out: Similar degrees of infection were produced in two batches, one of which was kept on poor, the other on rich diet. The anaemia developed quicker and more severely in the former in which values of 40 per cent Hb. were found after 5 months, while in the dogs on rich diet, the maximum reduction of Hb. at the end of this period was 25 per cent. This experiment supports the importance of food deficiency in contributing to the development and rapid progress of this anaemia. The frequency of gastro-intestinal manifestations in helminthic anaemia, *e.g.* glossitis, dysphagia, gastric anacidity, enteritis with deficient absorption, dysentery, etc., has already been referred to in the previous report. These manifestations have a probable aetiological relation to the production of anaemia, because:

(a) Loss of appetite or discomfort induces the individual to restrict or modify his diet.

(b) Anacidity hinders the absorption of the iron available in the food.

(c) Intestinal absorption is impaired, as demonstrated in some such cases of helminthic anaemia by the glucose absorption curve.

Analysis of these cases as to the relation of the degree of anaemia to the condition of gastric acidity, as shown in the following table, indicates the significance of gastric secretion. The fact that these anaemias improve markedly, even in the presence of the parasites, if iron is supplied, suggests substitution therapy and that iron deficiency is an important factor in the production of this anaemia.

It can be concluded from these studies that although blood loss, and possibly toxins are contributing factors in the production of this anaemia, yet the essential and more important mechanism is nutritional deficiency resulting from deficient diet and gastrointestinal pathology. The deficiency is mainly iron deficiency, although other substances such as lecithin, proteins, etc., are possibly also involved.

#### *Treatment.*

In the previous report, the following procedures and methods of treatment were reported and commented upon :—

(1) Treatment of the parasitic infection.

(2) Full diet.

(3) Liver therapy      { (a) Raw liver by mouth.  
                              { (b) Concentrated liver extract by injection.

(4) Iron therapy      { (a) By mouth.  
                              { (b) By injection.

#### *Trial of Other Methods of Treatment in Helminthic Anaemias.*

During this year, the effects of copper, arsenic, vitamins and blood injections in cases of helminthic anaemia, were studied. The following results were obtained :—

*Copper.*—The importance of copper as a factor in the formation of haemoglobin has been demonstrated in the milk anaemia of rats. It is argued that copper is necessary for the mobilisation of iron for the subsequent synthesis of haemoglobin.

Copper sulphate, 10–20 drops of a 1 % solution, t.d.s., was given with iron in 12 cases of helminthic anaemia with no apparent enhancing effect of the former. In another series of 7 cases, copper sulphate was administered after the maximum effect of iron was reached. No further rise of haemoglobin, red blood corpuscles or reticulocytes occurred. These experiments show that there is no copper deficiency in helminthic anaemias.



*Arsenic.*—In the previous report reference was made to the study of the effect of arsenic on bone-marrow activity. As its effect in this respect is still debated, the following experiments were carried out to elucidate the question :—

(1) Effect of sodium cacodylate on the reticulocytes of white rats (see report of the Institute, Section of Experimental Pathology and Medicine). The experiment shows that arsenic acts as a depressor of the bone-marrow with a decrease in the production of reticulocytes during its administration.

(2) Sodium Cacodylate, was given subcutaneously for a period of 15 days in 11 cases of helminthic anaemia (7 before and 4 after administration of iron). In 9 cases, the haemoglobin was reduced by 5 per cent. In 4 cases, this was associated with a reduction of red blood corpuscles of about 0·03 of a million. The reticulocytic count showed diminution during the arsenical treatment and in no case did a reticulocytic rise occur.

These experiments show that arsenic has no place in the treatment of helminthic anaemia. The mixture—iron and arsenic of the British Pharmacopoea—is of no value in the treatment of this condition on account of the small amount of iron it contains and of the non-haemopoietic effect of arsenic. In the Research Institute, a mixture containing 1·5 ferri et ammon. cit. in each dose with some syrup is the routine treatment in the out-patient department.

*Vitamines.*—The role of marmite has been demonstrated in the treatment of some anaemias. These are mainly macrocytic, while helminthic anaemia is micro-normocytic. 17 cases were given marmite without effect on the blood picture. 8 of these cases were associated with pellagra, and in spite of the rapid improvement of some of the pellagric manifestations, no reticulocytic rise or change in the blood picture could be obtained.

Administration of vitamine C produces a haemopoietic response with a reticulocytic crisis without the aid of any other haemopoietic agent in C avitaminosis (scurvy anaemia) only. The administration of this substance in the form of fresh fruit and vegetables in 11 cases of helminthic anaemia was not followed by any haemopoietic response.

This shows that vitamine deficiency does not play any role in the production of helminthic anaemias.

*Blood Injection.*—It is suggested by certain experimental studies that blood loss results in deprivation of the body of a haemopoietic substance found in the red blood corpuscles (Castle et al.).

Blood injections were given to 6 patients with helminthic anaemia. Only two showed an increase of haemoglobin of 5 per cent and 10 per cent respectively with a corresponding rise in the red blood corpuscles. These results do not suggest that the loss of blood is the essential factor in this anaemia.

### B.—HEPATOSPLENOMEGALIES

#### *Diagnosis of Splenic Enlargement.*

This is usually not difficult, but there are some cases in which it is difficult to decide the nature of the tumour in the region of the spleen. Four such cases were met with in which consideration of the clinical signs alone left the diagnosis in doubt. The latter was only ascertained by using such procedures as the effect of adrenalin on the size of the tumour or hepatolienography. The former is recommended on account of its simplicity and of the help it gives in cases where the enlargement is still associated with some contractile power of the organ.

#### *The Nature of So-Called Egyptian Splenomegaly.*

This term has caused much confusion and mixing of many conditions of splenomegaly of various causations which exist in Egypt. They have already been discussed in the previous report. The type meant by this term belongs to the hepatolienal group of diseases and is primarily a liver disease of bilharzial cirrhotic (mostly hypertrophic) nature and splenic enlargement is one of its frequent manifestations. This is supported by the following observations:—

(1) In no case of the so-called Egyptian Splenomegaly in which the diagnosis was confirmed and other factors excluded, was the liver free from disease (clinically or otherwise).

(2) There are many cases of bilharzial liver disease without enlarged spleens.

(3) In every case of splenomegaly without evidence of liver implication, a cause for this condition other than bilharziasis could be elicited.

#### *Scheme for the Diagnosis of Splenomegaly in Egypt.*

The following scheme carried out in the Research Institute has been successful in effecting this separation although not always completely. Such separation is essential for the thorough clinical and pathological study of this endemic form.



*Scheme.*

History : Especially malaria and other fevers, dysenteric symptoms, haemorrhages and history of previous anti-bilharzial treatment. This last point should be emphasized before an assurance on the non-bilharzial nature of a case is given.

Complaint : Gastro-intestinal bleedings, fever, pain in the region of the spleen, etc :

*Clinical Examination—General:*

Skin : Purpura, haemochromatosis, xanthomatous nodules of leukaemia or Hodgkins, etc.

Spleen : Size, shape, consistency, tenderness, contractile power, etc.

Liver : Size, shape, consistency, tenderness, collateral circulation, ascites, jaundice, gastro-intestinal bleeding, etc.

Heart—Lungs.

Alimentary Canal : Haemorrhages, dysentery, etc.

Glands : External, internal, biopsy.

Bones : Osteosclerotic anaemia, Cooley's anaemia, Albers-Schönberg, etc.

Joints : Still's disease, Felty's syndrome, etc.

Fever : Type, periodicity, response to quinine, response to antimony, etc.

Nervous system : Wilson's disease, subacute combined degeneration, leukaemic or lymphogranulomatous cord compression.

*Investigations :*

Haematological : Hb., R.B.C's., Reticulocytes.

Volume-index, Diameter-index.

W.B.C's. Differential : Eos. Neut. Lymph. Monocytes.

Immature cells. Atypical.

Fragility of R.B.C's.

Parasites : malaria, relapsing fever, spirochaetes, etc.

Provocation : Henry's reaction etc.

If haemorrhagic : bleeding time, clotting time, clot retraction, platelet count, vascular test, etc.

Biochemical : Plasma bilirubin or icterus-index.

Cholesterol : in lipid group.

Blood-sugar curve.

Serological : W.R. (after provocation) or Kahn.

Agglutination tests : in cases with fever.

Blood cultures : in cases with fever.

Formol-gel test, Antimony test, etc.

Biopsy : Liver puncture.

Bone-marrow puncture.  
 Splenic puncture or splenectomy.  
 Glandular puncture or removal.  
 Gastro-intestinal: Test-meal, sigmoidoscopy.  
 Stools.  
 Barium X-rays.  
 Urine analysis.

### *Bilharzia Cutaneous Reaction.*

A negative result of this reaction should throw doubt on the diagnosis of the endemic form of splenomegaly and should lead the clinician to search for another cause. Two cases have recently proved the significance of this fact; a case of splenomegalic cirrhosis with ascites giving a negative B.C.R. showed in the post-mortem room no evidence of bilharziasis and was found to be toxic cirrhosis without splenomegaly. A second case showed no evidence of bilharziasis except a positive B.C.R., spleen removed by operation showed *Bilharzia* ova on digestion with caustic soda.

### Relation to Bilharziasis :—

	In-patients	Out-patients
Total ... ..	22	238
Evidence of bilharziasis ... ..	15	161
Urinary alone ... ..	—	82
<i>Intestinal alone :—</i>		
<i>S. mansoni</i> ... ..	8	34
<i>S. haematobium</i> ... ..	—	4
Both ... ..	—	2
<i>Urinary and intestinal :—</i>		
<i>S. mansoni</i> ... ..	11	20
<i>S. haematobium</i> ... ..	—	11
Both ... ..	—	1
B.C.R. ... ..	6	7
No evidence of Bilharzia ... ..	7	77
		(B.C.R. was not made in every case of the O.P.)
Syphilis ... ..	2	3
Malaria ... ..	1	—
Tuberculosis ... ..	2	—
Leukaemia ... ..	1	1
Undetermined ... ..	1	—
Enteric group ... ..	—	13



In the in-patients, sigmoidoscopy and B.C.R. were carried out as a routine in every case, while this was not done in the out-patients. Hence, the number of non-bilharzial cases in the latter is certainly higher than it should be if these examinations had been carried out. These procedures are now undertaken in the out-patient department to verify this point and to illustrate their values.

*Search for Infantile Kala-Azar in Alexandria.*

A.— 50 cases of hepatosplenomegaly were submitted to various investigations as to their nature. Sternal puncture was made in every case so as not to overlook any case of Kala-Azar. The results obtained are as follows :

Von Jaksch Anaemia	...	...	...	...	...	...	...	...	4
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*Evidence of bilharziasis:—*

Intestinal only	...	...	...	...	...	...	...	...	12
Urinary only	...	...	...	...	...	...	...	...	3
Only B.C.R. positive	...	...	...	...	...	...	...	...	7
								—	22

*Evidence of syphilis:—*

W.R. positive	...	...	...	...	...	...	...	...	6
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*Evidence of malaria:—*

Henry's reaction positive	...	...	...	...	...	...	...	5
Evidence of leishmaniasis	...	...	...	...	...	...	nil.	
Formol-gel...	...	...	...	...	...	negative	in all.	
Sternal puncture	...	...	...	...	„	„	„	
Negative for everything	...	...	...	...	...	...	...	13

B.—Smears from spleens and bone-marrow of 400 dogs were examined for evidence of canine leishmaniasis with negative results. On account of the great clinical similarity of visceral Leishmania with the endemic and malarial hepatosplenomegalies, clinical diagnosis of the former should not be accepted as evidence of its presence without demonstrating Leishmania bodies by splenic, liver or bone-marrow puncture. The last is preferable for the following reasons:—

- (1) No previous preparation of the patient is needed.
- (2) The method is free from danger. No untoward effects or inconveniences were encountered in a series of 200 cases.
- (3) Sternal puncture is more suitable in children where the spleen cannot be fixed on account of crying.

(4) Leishman bodies could be demonstrated as early as the tenth day of the disease before the spleen is sufficiently enlarged for splenic puncture and also in the chronic stage when the spleen is fibrosed and contains only very few parasites.

A simple method for obtaining bone-marrow material by puncturing the sternum has already been published (Journal of the Egyptian Medical Association, Vol. XVII, No 10, 1934).

#### *Liver Function Tests in Hepatosplenomegaly.*

(1) Icterus-index estimation according to the method of Meulengracht was carried out in 87 cases of bilharzial cirrhosis with splenomegaly. It showed normal values in 75 cases and higher values in 12 cases. In the cases which showed a higher icterus-index, a complicating factor, *e.g.* malaria, syphilis, etc., could be elicited in 5 cases where the high icterus-index was due to haemobilirubin (haemolysis), while a rise due to cholebilirubin was detected in 7 cases. This can be explained by the presence of intrahepatic biliary obstructions of hepatitis. Haemobilirubin and cholebilirubin were differentiated by the qualitative Van den Bergh.

(2) *Urobilinogen* was found positive (1+) in 18 cases only. These positive values suggest a complicating or hepatic factor in these cases.

(3) *Galactose tolerance test.*—In performing this test, we took into consideration both the galactosaemia and galactosuria following the administration of galactose. We also considered the test to be positive if there was a maximum rise in the blood-sugar of over 60 m. grms above fasting level. This test was carried out in 36 cases of uncomplicated bilharzial cirrhosis with splenomegaly. Positive values in the blood-sugar curve were found in 5 cases (13 per cent.) These cases showed negative galactosuria. For results of this test in other stages of hepatic bilharziasis, see “Schistosomiasis.”

(4) *Takata-Ara reaction.*—This is a colloid reaction originally for application to chest fluid which was later suggested to be applied to blood serum and was found to aid in determining the presence of liver cirrhosis. This test was carried out in 20 cases of endemic hepatosplenomegaly and in 6 cases of chronic malarial hepatosplenomegaly, for the purpose of detecting cirrhotic changes in the former group, thus aiding in their differentiation from the latter group. The test was negative in all cases in both groups. The results of this test in various stages of bilharzial cirrhosis as well as in other hepatic disturbances are being studied. The results will be published when sufficient data are available.



### *Uric Acid Metabolism in Endemic Hepatosplenomegaly.*

A case of hepatosplenomegaly (previously reported) in which the blood uric acid showed repeatedly very high values (11–16 mgrms per cent) was met with. Accordingly, studies on the uric acid metabolism in this condition were carried out.

This question as well as the relation of the high blood uric acid to the condition of the liver and spleen or both are still under investigation. The marked fall of the blood uric acid after splenectomy (in this reported case) suggests the enlarged spleen playing a role in this respect.

### *Hepatolienography.*

Hepatolienography by thorotrast was carried out in 16 cases up till now. The following points were noticed:—

(1) The total dose of 75 c.c. produces a diffuse shadow of the spleen without any interruption as should be expected by fibrous bands, lymphoid nodules, etc. This suggests that the pathological process is a uniform hypoplastic condition mainly of the reticulo-endothelial system.

(2) With this method, the condition of the liver could also be commented upon. This was especially of value in 3 cases where no signs of liver cirrhosis could be demonstrated clinically. Hepatolienography showed irregularity of the edge and shadow of the liver. An idea about the condition and visualisation of the liver after splenectomy could also be formed in 3 cases:

(a) A dose of 30 c.c. of thorotrast was sufficient to visualise the liver in the absence of the spleen.

(b) The patient's tolerance for the drug was not decreased after splenectomy (for a dose of 30 c.c.).

(c) In a case splenectomised 5 years previously, cirrhotic changes in the liver could be demonstrated by hepatography in the absence of any clinical evidence of this condition.

(3) In two cases of cirrhosis of the liver with ascites, an irregular fever of 7–10 days duration followed the administration of the first dose of the drug. In one of these, the galactose test (blood-sugar curve) became positive although it had been previously negative. In the other case the ascites increased.

(4) Three cases of endemic hepatosplenomegaly were injected with thorotrast and then splenectomised for the purpose of studying the histology of the spleen containing the drug. Results will be published later.

(5) As a result of the idea that thorotrast may be injurious to the organism by its radio-activity after some time, it was arranged to examine cases injected with the drug at intervals of some months as regards liver function, blood picture, size of spleen, general condition, etc. Results will be published later.

### *Splenectomy.*

Splenectomy is performed in chosen cases of bilharzial cirrhosis with splenomegaly. The following questions are being investigated:—

(1) Effect of splenectomy on the blood picture: The red, white and platelet pictures as well as the diameter and fragility of the R.B.C's are examined at intervals of one month. Results will be published when sufficient data are available.

(2) Effect of splenectomy on liver conditions: Liver function tests as well as clinical studies regarding the course of the cirrhotic process are carried out.

### *Studies on Removed Spleens of Cases of Endemic Hepatosplenomegaly.*

Spleens of studied cases are removed and sent to the Institute immediately after removal. The following studies are undertaken:—

(1) Incidence of fibrosiderotic nodules: Out of 51 spleens, 4 showed fibrosiderotic nodules, *i.e.* about 8 per cent. This incidence is less than that reported from the Faculty of Medicine. The fibrosiderotic nodules were numerous only in 3 cases. The nodules give a positive Prussian blue reaction.

(2) Presence of Bilharzia ova: A great part of the pulp of the spleen is subjected to digestion by 5 per cent caustic soda in the incubator at 37° C. for 4 days. The soda solution is changed daily. Examination of the sediment has shown ova in 5 cases, *i.e.* 10 per cent.

(3) Smears from the pulp of these spleens examined for Leishmania bodies and malarial parasites were negative in all cases.

(4) Histological studies: Sections of these spleens were stained with haematoxylin-eosin, Giemsa, Mallory, van Gieson, Prussian blue, etc.

Results of these examinations will be published later.



(5) Some of these spleens were submitted to thorough chemical analysis in the Biochemical Section. Results will be published when sufficient data are available.

*Diagnosis of Chronic Malarial Hepatosplenomegaly.*

*Analysis of 40 cases of Splenomegaly in Fayoum.*—This area was chosen on account of the presence in it of endemic malaria and the absence of *S. mansoni* bilharziasis. The object of the study was to find certain differential points between chronic malarial hepatosplenomegaly and the endemic form. 15 cases possessed the clinical picture of the endemic form; 9 of these were proved to be non-bilharzial by further investigations and 6 of them were shown to be malarial in nature. This shows that it is impossible to distinguish clinically between some forms of chronic malarial hepatosplenomegaly and the stages of the endemic form. Detailed investigations are necessary, *e.g.* :—

(a) Repeated search for malarial parasites after provocation.

(b) Icterus-index estimation, reticulocytic and monocytic counts (if these show higher figures than normal, they suggest the malarial nature of the affection).

(c) Effect of adrenalin on temperature and monocytic count. It has been frequently noticed in the study of these cases that a rise of 1–2° occurred within two hours of the injection, a rise of the monocyte percentage was also observed. These findings were not obtained in a series of endemic splenomegaly cases without evidence of malaria, subsequently examined in the Institute. These observations suggest that such results of adrenalin injections may be utilised for diagnosing the malarial nature of such cases.

(d) Sternal puncture may help to demonstrate malarial pigment in the material obtained from such cases.

C.—MALARIA

*Haemolytic Attacks in Malaria under Plasmochine Treatment.*

? *Black-Water Fever.*—On account of the absence of reported cases of black-water fever in Egypt, the following 2 cases are reported :

*Case 1.*—Benign tertian malaria parasites, quotidian fever, first attack, never had quinine, was admitted to hospital and put on atabrin plasmochine 0.01 gramme t.d.s. On the fourth day, patient was found collapsed, jaundiced, bilious vomiting, fever and brownish black urine, mainly methaemoglobinuria and methaemoglobinaemia.

Blood examination showed severe haemolytic crises. Haemoglobin fell from 65 per cent to 17 per cent and the jaundice was haemolytic in nature. Patient was cured and discharged.

*Case 2.*—Benign tertian malaria, chronic, afebrile given plasmochine two tablets t.d.s. for one day. On the second day, patient had nothing, and on the third day was brought collapsed, jaundiced, with fever, bilious vomiting and black urine.

Investigations showed methaemoglobinuria and methaemoglobinaemia and haemolytic crisis.

The occurrence of these attacks in two cases having plasmochine suggested the possibility that they belong to plasmochine methaemoglobinaemia, but looking through the literature on this subject, it was not possible to find similarity between these two cases and plasmochine methaemoglobinaemia as no haemolytic phenomena had been described with plasmochine and no methaemoglobinuria.

Whether these cases are the result of plasmochine or genuine black-water fever could not be decided. Atebrin does not seem to prevent the occurrence of haemolysis.

#### D.—LEISHMANIASIS

Attempts to treat Oriental sores by various general and local methods have already been published. During this year, three additional methods of treatment were tried:

(1) *Berberine sulphate solution.*—To be injected locally into the centre and margins of the nodules as suggested by Indian workers. The following are the results obtained in 8 cases of Oriental sore, all positive for Leishmania bodies:—

(a) 2 cases received one injection each. No reaction developed and no effect on the parasites was noticed.

(b) 3 cases received three injections each at intervals of 2 days. In two of these, swelling and inflammation occurred and they were found negative after the second injection; in the third case, no local reaction developed and the parasites did not disappear.

(c) One case received 4 injections. Inflammatory reaction developed; local improvement occurred, but the lesions were still positive at the end of treatment.

(d) 2 cases received 6 injections each. Inflammatory reaction developed in both with pus formation in one, but both were still positive at the end of treatment.



This shows that berberine sulphate solution injected locally produces an inflammatory reaction which may be accompanied by pus formation. This reaction may result in apparent improvement in the local lesion, but parasitic studies have shown that it is not capable of destroying the parasites in the lesions even after 6 injections.

At the end of treatment the parasites were proved to be viable in culture in some cases.

(2) *Solganal* injections intramuscularly have been shown to be of value in curing experimental *Leishmania tropica* nodules on the tails of white rats. Accordingly, a case with multiple nodules of cutaneous leishmaniasis was injected every other day with ascending doses of solganal solution intramuscularly. Examination for parasites at intervals (microscopic and by culture) showed that the case remained positive till the end of treatment (a total of 12 injections was given) and also one month later.

(3) *Trypaflavine* injections intravenously every other day up to 10 injections did not have any effect on the positivity of parasites nor on the local condition in a case with multiple ulcers.

#### *Visceral Leishmaniasis.*

In view of previous publications suggesting the existence of this condition in Egypt, the possibility of its presence is still taken into consideration. In cases of hepatosplenomegaly, that spent some time in the Sudan, and in children with enlarged spleens, livers and fever, the parasites were looked for :

(1) 50 cases of hepatosplenomegaly studied in Alexandria showed negative results (see hepatosplenomegaly).

(2) Smears from 51 spleens removed by operation showed negative results.

(3) Three cases of hepatosplenomegaly in adults, having been some time in the Sudan, were negative for visceral leishmaniasis.

These cases were all investigated clinically, haematologically and serologically. In addition, sternal puncture for the demonstration of parasites was performed in all.

#### *E.—DYSENTERY*

Patients complaining of dysentery were submitted to the following examinations :—

(1) Microscopical examination of stools for

(a) protozoa.

(b) *Schistosoma* eggs.

(c) *H. heterophyes*.

(2) Bacterial culture.

(3) Sigmoidoscopic examination.

(4) Test meals and liver function.

The total number of cases was 242, classified according to their aetiology.

(1) Cases positive for <i>E. histolytica</i> ... ..	36
(a) Vegetative <i>E. histolytica</i> .... ..	31
(b)       ,,       ,,       ,,       and cysts     ... ..	1
(c) <i>E. histolytica</i> cysts     ... ..	5
(d) <i>E. h.</i> with <i>Trichomonas</i> ... ..	1
(e) <i>E. h.</i> with <i>Lambli</i> a ... ..	1
(f) <i>E. h.</i> with <i>Schist. mansoni</i> ... ..	2
(g) <i>E. h.</i> with <i>Schist. haematobium</i> ... ..	4
(2) Cases positive for <i>Schistosoma</i> eggs ... ..	65
(a) <i>Schist. mansoni</i> ... ..	27
(b) <i>Schist. haematobium</i> ... ..	34
(c) <i>Schist. haematobium</i> and <i>mansoni</i> ... ..	4
(3) Cases positive for <i>H. heterophyes</i> eggs     ... ..	5
(4) Cases positive for bacillary dysentery     ... ..	2
(a) Flexner's bacillus     ... ..	1
(b) Morgan's bacillus     ... ..	1

The cases attending the out-patient clinic usually came after suffering from the disease for some days, and therefore the causative organisms were very difficult to isolate. Moreover, the patients did not attend for more cultures.

(5) Cases positive for Flagellates only ... ..	5
(a) <i>Trichomonas intestinalis</i> ... ..	3
(b) <i>Lambli</i> a <i>intestinalis</i> ... ..	2
(6) Cases negative for Protozoa Ova and Bacteria     ... ..	134



Five cases were submitted to bacterial culture twice with negative results. 32 cases were submitted to sigmoidoscopic examination with the following results:—

(a) 7 cases showed normal mucous membrane in the lower 10 inches of the rectum, suggesting the probability of a higher lesion.

(b) 2 cases of ulcerative colitis.

(c) 3 cases showed granular mucous membranes with no ulceration.

(d) 16 cases showed congestion and oedema of the mucous membranes with severe catarrhal inflammation.

(e) 2 cases showed papillomata of bilharzial origin.

(f) 1 case showed localised inflammation round the anus with a history of acute urethral gonorrhoea. The symptoms were relieved by the specific treatment.

(g) 1 case showed a fungating tumour of malignant nature.

#### *Amoebic Dysentery (Therapeutic Trials).*

Dyschural: This preparation (in tablets) contains papaverine in combination with the 7 iodo, 8 oxy quinoline, 5 sulfonique (04 grm. + 03 grm. emetine).

Used in the out-patients, it was given to 12 cases according to the recommendation of the manufacturing firm. (4 tablets and one ampoule daily for 6 days to be repeated after two weeks interval).

Out of the 12 cases, 10 completed the first course. Examination showed the absence of vegetative *E. histolytica* and cysts in 7 cases and the disappearance of all the symptoms in all. The remaining 3 cases were given another course and were asked to come after a fortnight, but they did not turn up.

Out of the 7 cases, 3 came after two weeks, and examination showed that they harboured no parasites.

It is very difficult to give an idea about the efficacy of the drug on such cases owing to the impossibility of following them after finishing the treatment. Almost all the patients were lay-people who would soon stop coming to hospital once the acute symptoms disappeared.

The drugs were well tolerated and the acute symptoms usually disappeared on the fourth day.

#### *F.—FILARIASIS*

An explanation of the filarial periodicity has been attempted from various points of view. Biochemical differences in the blood of patients during day and night have been suggested as significant.



During this year we have met with three cases of filariasis complicated by other conditions leading to disturbance in the blood chemistry. These cases were found suitable for studying the effect of changes in the blood chemistry on the number of circulating microfilariae.

*Case 1.*—Diabetes mellitus, ketosis, *Microfilaria bancrofti*—positive Microfilarial counts carried out daily at the same time, (12 midnight) were followed—during the stage of ketosis, during a stage of hyperglycaemia without ketosis, during a stage of controlled blood-sugar (insulin) and then during a stage of artificial alkalosis. The counts showed lower figures with many dead microfilariae during the ketosis stage. No effect of changes in blood-sugar on the count was observed.

*Case 2.*—Toxic hepatic jaundice with positive *Microfilaria bancrofti*. Microfilarial counts were followed during the gradual improvement of the jaundice. The results show that the icteric state of the blood and the disturbed glycogenic liver function do not affect the microfilarial count, as no change occurred in the count during the improvement of both these disturbances.

*Case 3.*—Benign tertian malaria with *Microfilaria bancrofti*.—The microfilarial count was followed during the febrile and afebrile periods. The results show that no significant changes in the count take place.

As a result of the findings obtained in the first case, artificial ketosis was produced by ketogenic diet in another case with positive *Microfilaria bancrofti*. Following the microfilarial counts before and after the occurrence of ketosis, many dead microfilariae were found in the blood and a reduction in the total number was noticed some days after the development of the ketosis.

This experiment confirms the findings obtained in the first case. Further investigations are undertaken to explain the mechanism and significance of these findings.

#### G.—SCHISTOSOMIASIS

The statistical analysis of cases examined in the Out-patient Department of the Institute during 1934 has already been mentioned.

##### *Bilharzial Liver.*

Evidence of liver implication could be detected in 5 per cent of all positive Bilharzia patients. In urinary *Sch. haematobium* infection, the liver is affected in 4 per cent of the cases, while in intestinal *Sch. mansoni* infection, it is affected in 20 per cent of the cases. This means that the liver is affected five times more often in *Sch. mansoni* than in *Sch. haematobium* infection.



In 23 cases of uncomplicated Bilharzia with clinically normal livers, studies of liver functions have shown the following :—

(1) The galactose test (blood-sugar curve) was positive in 8 cases, *i.e.* 25 per cent.

(2) The icterus-index was higher than normal in 2 cases, *i.e.* about 9 per cent.

(3) Urobilinogen was positive in 3 cases, *i.e.* about 13 per cent.

These manifestations of disturbed liver functions disappeared more or less completely under anti-bilharzial treatment and suggest that Bilharzia is the causative agent. These cases constitute the pre-clinical manifestations of hepatic Bilharziasis.

In 20 cases of uncomplicated Bilharzia with clinical evidence of pathological livers (enlargement, cirrhosis, etc.), studies of the liver functions have shown the following :—

(1) Galactose test (blood-sugar curve) was found to be positive in 7 case, *i.e.* 35 per cent.

(2) The icterus-index was higher than normal in 3 cases, *i.e.* 15 per cent.

(3) Urobilinogen was positive in 4 cases, *i.e.* 20 per cent.

Anti-bilharzial treatment resulted in improvement of these disturbances in more than half the cases. In addition some cases with enlarged smooth livers (no evidence of cirrhosis) showed moderate reduction in size at the end of treatment. This reduction, occurring in the short period of treatment and not associated with any signs of increased portal obstruction, suggests that it is a result of improvement and not due to advanced cirrhosis.

These investigations show how frequently the liver is affected in Bilharzia not only clinically but also pre-clinically (functionally without any clinical manifestations) and how this affection is influenced by anti-bilharzial treatment.

### *Bilharzial Haemospermia.*

Blood in the semen may occur in many diseases, whether inflammatory, traumatic or neoplastic of one or more of the following organs :—

Testes, epididymis, ductus deferens, seminal vesicles, prostate, Cooper's glands and the urethra.

To diagnose a case of haemospermia, these organs must therefore be thoroughly examined. All may be affected in Bilharzia.

7 cases of bilharzial haemospermia are collected up to date, 3 of these have already been published in the Annual Report of 1932.

They were due to *Bilharzia* of the seminal vesicles. In addition to the methods of investigations outlined for these cases, urethroscopic examination as well as X-ray pictures of the urinary tract were carried out in the last 3 cases. Details of these cases will be seen in the publication (Proceedings of the Society of Endemic Diseases and Tropical Medicine, Vol. XVIII No. 1, April 1935).

The following deductions could be drawn from an analysis of these 7 cases :—

(1) In no case could a history of gonorrhoea be elicited, nor could gonorrhoea be found after prostatic massage.

(2) Urinary *Sch. haematobium* was present in 5 cases out of the 7, while one case gave a positive B.C.R. (*Bilharzia* cutaneous reaction).

(3) Stools were negative for *Bilharzia* ova in all cases.

(4) Semen was positive for *Sch. haematobium* ova only in one case.

(5) Seminal vesicles were enlarged and nodular in all as palpated per rectum and could be readily differentiated from prostatic enlargement.

(6) Prostate was hard and atrophic in 3 cases.

(7) The cord was only affected in one case.

(8) In one case a mass was seen in the supra-montanal fossa, which might explain the occurrence of haemospermia as well as haematuria.

(9) It is not necessary for *Bilharzia* of the seminal vesicles to cause haemospermia. This was present in 6 cases, while the seventh showed only interrupted micturition.

(10) As regards the effect of treatment, one case reported intermission of symptoms, 2 showed no improvement at all on anti-bilharzial treatment and one reported the disappearance of the haemospermia without any treatment.

#### *Acridine Compounds in the Treatment of Schistosomiasis.*

As a result of a publication by Fisher on the cure of schistosomiasis in 5 cases by oral administration of acriflavine, this substance as well as other allied compounds were at once submitted to trial. If the value of this method were proved, it would be far superior to the antimony treatment.



81 adult patients suffering from urinary or intestinal Bilharzia or both were given the following compounds:—

(1) Trypaflavine is solution given orally (3 cases) in a daily dose of 20 c.c. of a 2 per cent solution. Living ova were found in the urine at the end of the treatment in all and after 2 weeks in one.

(2) Trypaflavine in capsules is better tolerated than the solution. Various doses were given in the 53 cases treated. Of these, 47 were suffering from *Schistosoma haematobium* and 6 from *Schistosoma mansoni* infections:

(a) 17 cases received a daily dose of 0·1 gramme for 7 to 20 days.

(b) 13    „        „        „        „        0·2    „        „    3    „    20    „

(c) 5 cases received a daily dose of 0·3 gramme for 1 to 3 days. Vomiting necessitated a reduction of the dose to 0·2 gramme. This was continued from 2 to 16 days.

(d) 12 cases received a daily dose of 0·5 gramme for a period of 1 to 2 days. Vomiting necessitated a reduction of the dose to 0·3, This was given for 1 to 4 days. Vomiting continued and the dose was further reduced to 0·2 gramme. This was given for 1 to 10 days. The total amount of the drug given in this series, varied from 1 to 3 grammes.

(e) 6 cases with *Sch. mansoni* infection of the intestines (two of these had also urinary *Sch. haematobium* infection) received a daily dose of 0·1 to 0·3 gramme for 5 to 27 days. The total amount given varied from 1 to 6 grammes.

(3) Trypaflavine intravenously injected in 14 cases. All were infected with urinary *Sch. haematobium* and were treated by this method. 10 c.c. of a 2 per cent solution were given daily for 4 to 10 days.

(4) Diamino methyl acridine (May and Baker) in capsules, was used in 7 cases (2 *Sch. mansoni* and 5 *Sch. haematobium* cases), the daily dose being 0·1 gramme. A total dose of 0·7 to 2 grammes was given.

(5) Atebrin (Alkylamino-alkylamino acridine dihydrochloride) was employed in 4 cases. Total dose of 1·6–4·8 grammes was given.

The diagnosis was based upon microscopic examination of the excreta. The viability of the ova was ascertained by hatching before and after treatment. In intestinal schistosomiasis, swabbing the rectum and sigmoidoscopy were sometimes resorted to.

*Conclusions.*

(1) The results obtained by these varying doses and different means of administration showed conclusively that these acridine derivative have no curative effect on schistosomiasis due to *Schistosoma haematobium* or *Schistosoma mansoni*. Living ova (in nearly all cases) were present not only at the end of treatment but also one to four weeks later.

(2) Moreover, experiments in vitro (carried out in the Biochemical Section) showed that cercariae of *Schistosoma mansoni* lived for three hours in a dilution of 1 : 4,000 trypanflavine in diluted human serum and saline. Also *Schistosoma* ova in the urine of cases under treatment hatched and miracidia remained living for 2 hours.

(3) These drugs can be tolerated in fairly big doses, extending over 20 days. Liver functions were not affected in 3 cases with this dosage.

(4) The following effects were noted during the administration of these compounds :

(a) Erythema of face, followed by desquamation, appeared, especially after the administration of trypanflavine.

(b) Vomiting occurred with bigger doses. It was relieved by stomach wash with a solution of sodium bicarbonate.

(c) Two patients developed diarrhoea.

(d) Two patients developed fissuring and incomplete separation of the nails.



### List of Publication of the Staff during 1934

Serial  
Number

- 117 The Biology and Morphology of *Bolitophila hybrida* Meigen, by Dr. S. MADWAR, (Published in Bulletin la Société Royale Entomologique d'Egypte, Année 1933, Facs. 4, pp. 126-134).
- 118 The Biology and Morphology of *Pnyxia scabiei*, by Dr. S. MADWAR, (Published in the Bulletin de la Société Royale Entomologique d'Egypte, Année 1933, Fasc. 4, pp. 136-148).
- 119 Absorption Spectra in Relation to the Constitution of Keto-enols, by Dr. R. A. MORTON, Dr. ALI HASSAN and Dr. T. C. CALLOWAY, (Published in the Journal of the Chemical Society, Year 1934, pp. 883-901).
- 120 On the Life History of *Nephrostomum Ramosum* Sonsino, 1895, An Echinostome parasite from *Ardeola ibis ibis* (Buff-Backed ), by Dr. M. ABD-EL-AZIM, (Published in the Annals and Magazine of Natural History, Ser. 10, Vol. XIV, p. 154, July 1934).
- 121 Sternal Puncture, by Dr. M. SALAH EL-DIN (Published in the Journal of the Egyptian Medical Association, Vol. XVII, No. 10, October 1934 pp. 846-850).
- 122 The Treatment of Schistosomiasis with Acridine Compounds, by M. KHALIL BEY and M. SALAH-EL-DIN (Published in the " Lancet, " October 20, 1934, p. 862).
- 123 Dermal Leishmaniasis, a Study of Endemic Focus in Egypt, by M. KHALIL BEY, (Published in the Archiv für Schiffs und Tropen Hygiene, Band 38, Heft 10 Oktober 1934, pp. 417-426).
- 124 Combating Mosquitoes and Malaria in Alexandria and its Environments. (A Report to H.E. the Under-Secretary of State for Public Health Department), by M. KHALIL BEY (Published in the Journal of the Egyptian Medical Association, December 1934; Vol. XVII, No. 12, pp 944-958
- 125 *Fasciola gigantica* as an Antigen for the Skin Reaction in Human Schistosomiasis, by Dr. ALI HASSAN and Dr. M. H. BETACHE (Published in the Journal of the Egyptian Medical Association, December 1934, Vol. XVII, No. 12, pp. 992-993).
- 126 A Case of diabetes insipidus with splenomegaly, by Dr. M. Salah (Published in the Proceeding of the Clinical Society Kasr el Aini Hospital. 1934, p.p. 125-128).

## PART III

### Administrative Report

#### 1.—PERSONNEL

The personnel of the Research Institute and the Endemic Diseases Hospital, as sanctioned by the Budget of 1934-1935 are as follows :

Number	Post	Grade	Remarks
1	Director ... ..	—	Voluntary Worker.
1	Biochemist ... ..	4th	—
1	Parasitologist ... ..	4th	—
1	Medical Entomologist ... ..	4th	—
1	Clinical Pathologist ... ..	5th	—
1	Bacteriologist... ..	5th	Vacant.
3	Medical Officers ... ..	6th	—
1	Sanitary Engineer ... ..	6th	—
1	Head Nurse ... ..	7th	—
1	Clerk ... ..	8th	—
1	Clerk ... ..	8th	Low Grade.
1	Moawin ... ..	Hors Cadre.	—
1	Molahez ... ..	Hors Cadre.	—
7	Laboratory Assistant ... ..	Hors Cadre.	—
5	Nurse ... ..	Hors Cadre.	—
8	Male and Female Attendants ...	Hors Cadre.	—

#### 2.—EXPENDITURE

Expenditure	Amount	
	L.E.	M.
Salaries of permanent staff ... ..	3,336	808
Salaries of hors cadre staff ... ..	1,053	120
Transport, travelling, allowances and expenses ...	100	735
Food of in-patients and employés ... ..	209	435
Food of experimental animals ... ..	53	366
Gas, light and water ... ..	305	480
Telegrams and telephones ... ..	15	685
Equipment, furniture and laboratory materials ...	1,499	877
Uniforms ... ..	14	745
Petty expenses ... ..	9	273
Books and journals ... ..	1	592
Purchase of experimental animals ... ..	6	398
TOTAL ... ..	6,614	889



### *Cooking and Washing.*

The cooking and washing are still carried out by the adjoining Anti-Rabic Institute. The arrangement was resorted to for the sake of economy. The building of a kitchen and wash-house for the service of the Institute, was allotted in the budget of 1935-1936.

### *Buildings.*

The western fence of the Institute is not yet erected, this will be done in 1938.

A new street will be opened between the Institute and the Nile. The labourers are working hard to complete this work.

To the south of the Institute lies a plot of land of about 2,100 square metres reserved for the buildings of a hospital to hold 50 in-patients for research purpose.

### *Visitors.*

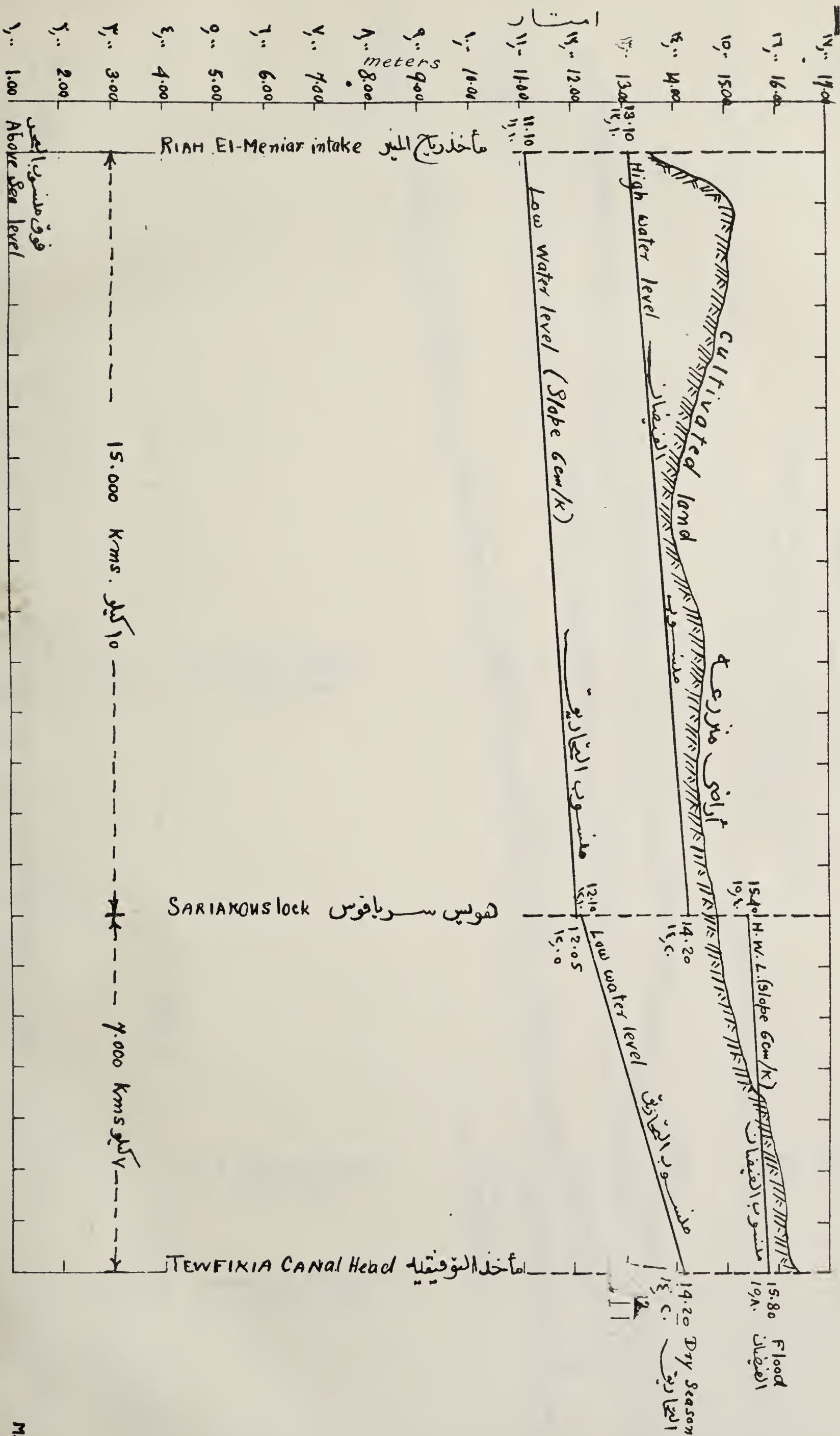
During the year, the institute and Hospital were visited by several distinguished people, amongst whom were :—

- (1) Dr. Aidy.
- (2) Prof. Thomson.
- (3) Prof. Cort.
- (4) General Duguet.
- (5) Prof. Fitzgerald.

### *Library.*

Several journals dealing mainly with tropical medicine and parasitology were transferred from the Public Health Library to be kept permanently in the Institute. A sum of L.E. 100 was allotted permanently in the budget to cover the subscriptions to the journals necessary for the maintenance of the library and the purchase of such text-books as are thought essential for occasional reference.

# مناسيب ترعة الإسماعيلية LEVELS OF ISMAILIA CANAL



M.S.M.

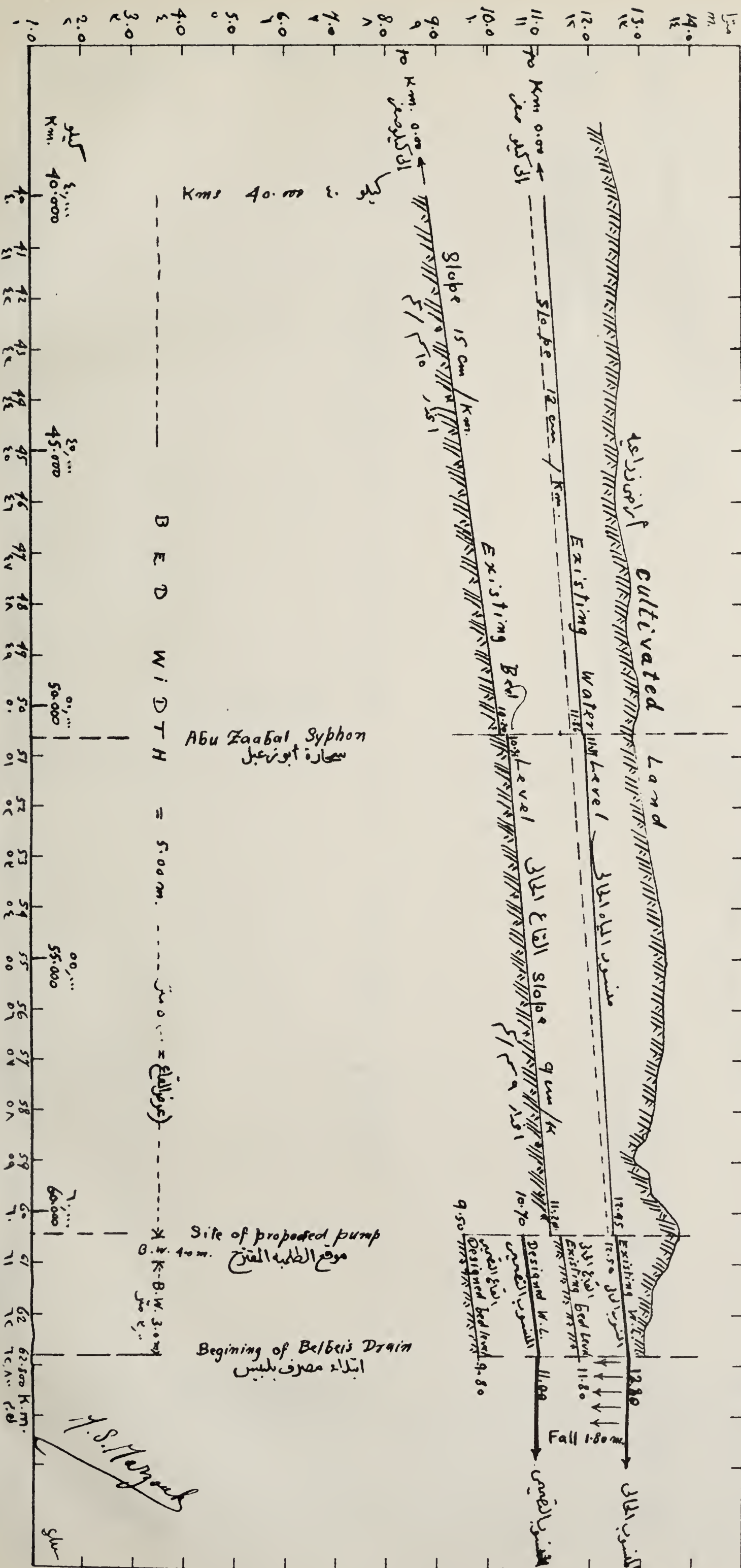




# مصرف بلبيس BELBEIS DRAIN

(Scheme for draining Birket El Hag at Birka town)  
(مشروع صرف منطقة بركة الحج ببلدة البركة)

Pump at K 60.450  
طلمبة عند كم. 60.450







مناسبت مهری الخجل الاعفی

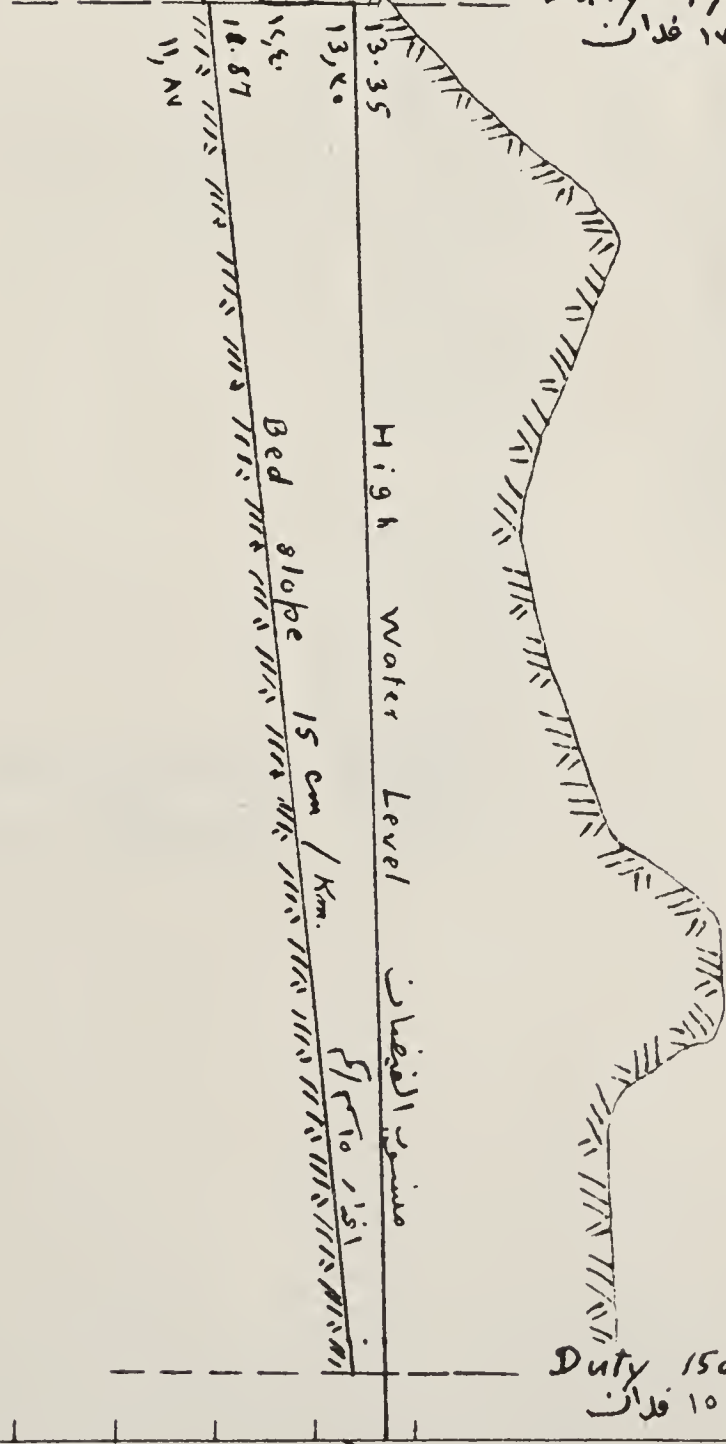
DRAIN

五

۲۶۰۰ فدان

۱۷۰۰ خداوند

۱۵۰۰ فدان



Bed width = 3.00 ms عرض الفراغ = 3.00 ms

Bed Width = 3.00 ms عرض الفراغ = 3.00 متر

Weir Km 3.150  
قدار غندگیو ۱۰.۰۰۰

Beginning Km 6.560  
المبدأ عند كيلو ٦٥٦٠

H. S. Marsh

Above sea level  
فوق سطح البحر

Outlet Km 0.00  
(المصب) كيلو

Hand-drawn profile of the H.S. Harzoub dam. The vertical axis on the left shows elevation in meters (0 to 9.00) and "Above sea level" in Arabic. The horizontal axis at the bottom shows distance in kilometers (0.00 to 6.00). The profile line shows the dam's cross-section. Key features include:

- Outlet (مصب)** at 0.00 km
- Weir** at 3.150 km
- Beginning** at 6.560 km
- Bed Width = 3.00 ms** (عرض القاع = 3.00 متر)
- Bed Width = 3.50 ms** (عرض القاع = 3.50 متر)

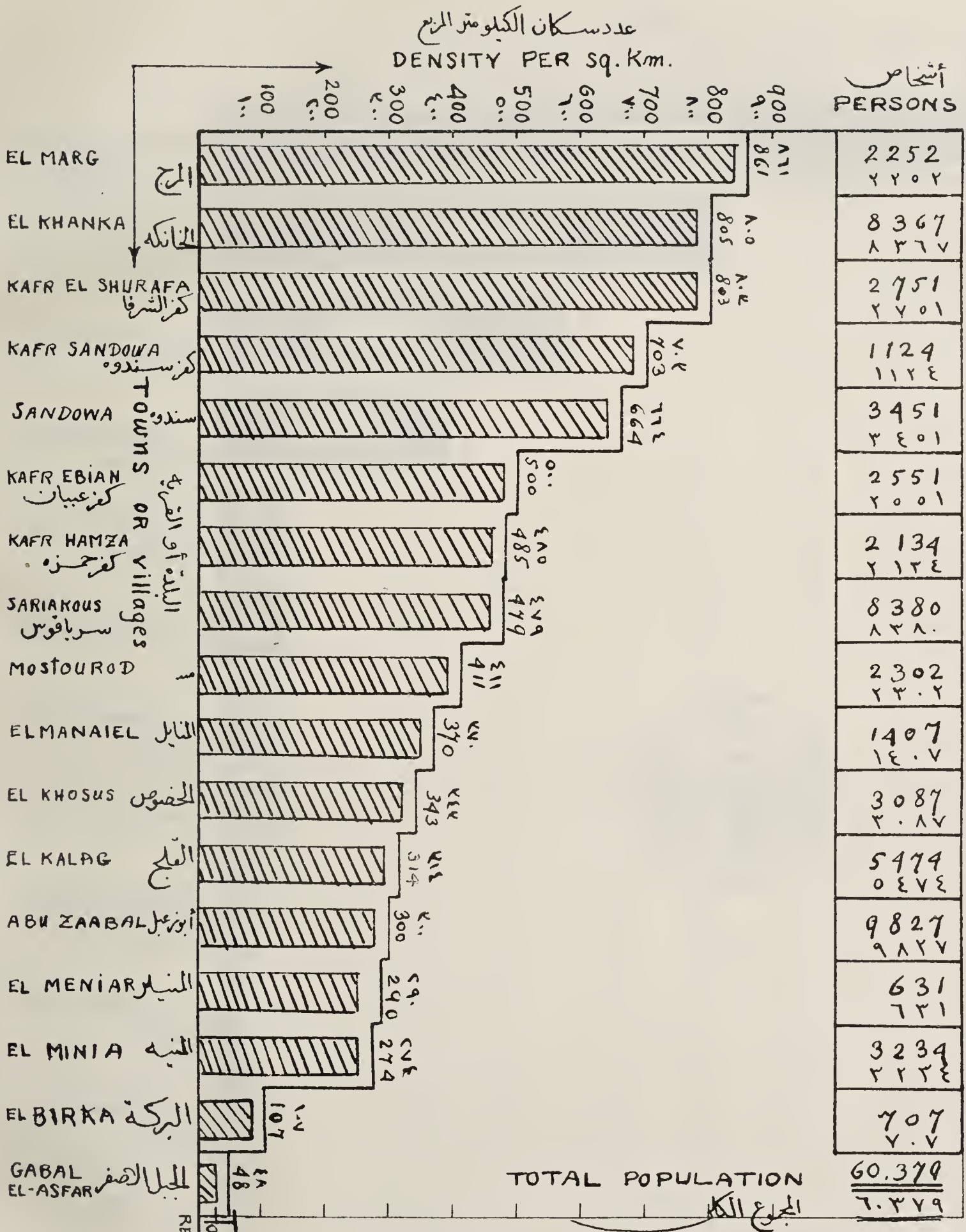
The dam is signed **H.S. Harzoub**.





# ازدحام السكان DENSITY OF POPULATION

(SENSUS OF 1927)  
(تعداد سنة ١٩٢٧)







NO OF BIRKAS →  
عدد البركة

Fed. فدان

50 45 40 35 30 25 20 15 10 5

FEDDAN  
فدان

ABUZABAL & KAHER  
EBIAN  
أبوزابل وكفر عبيان

EL KHUSOUS  
الخصوص

EL BIRMA  
البركة

SARIAKOUS  
سرياقوس

EL KHANKA  
الخانكة

EL MARG  
المرج

SANDOWA  
سندوف

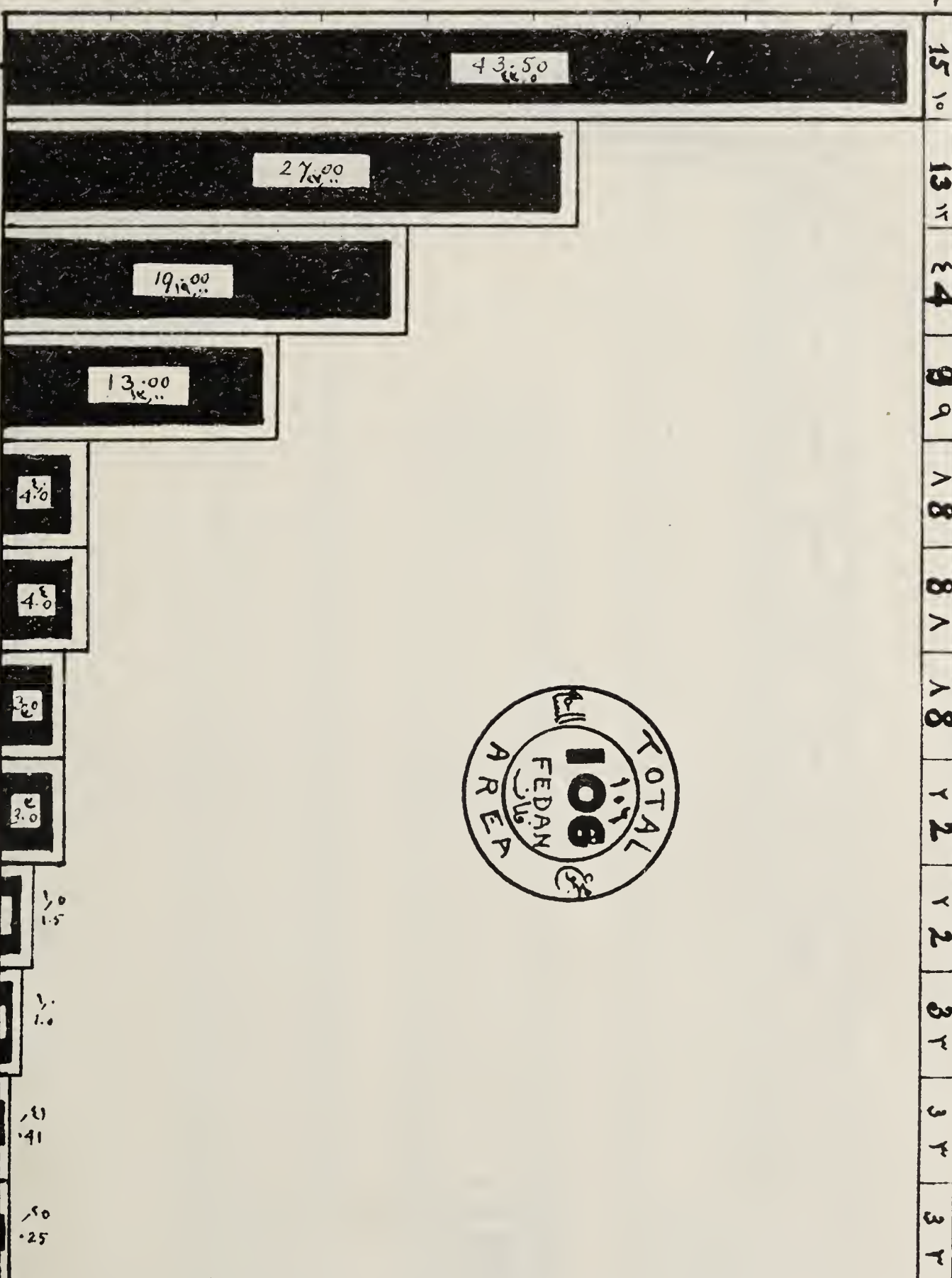
EL MENIAR  
المني

KAHR HAMZA  
كفر حمزة

EL MENIA  
المنية

EL MANAIEL  
المنابيل

EL QALAG  
القلج



STAGNANT WATER DISTRIBUTED

IN TOWNS

TOTAL  
108  
FEDDAN  
AREA

TOWNS OR VILLAGES

البلدان

T.S. Zaher

8/11





## البرك ومسبباتها

## BIRKAS ACCORDING TO CAUSE



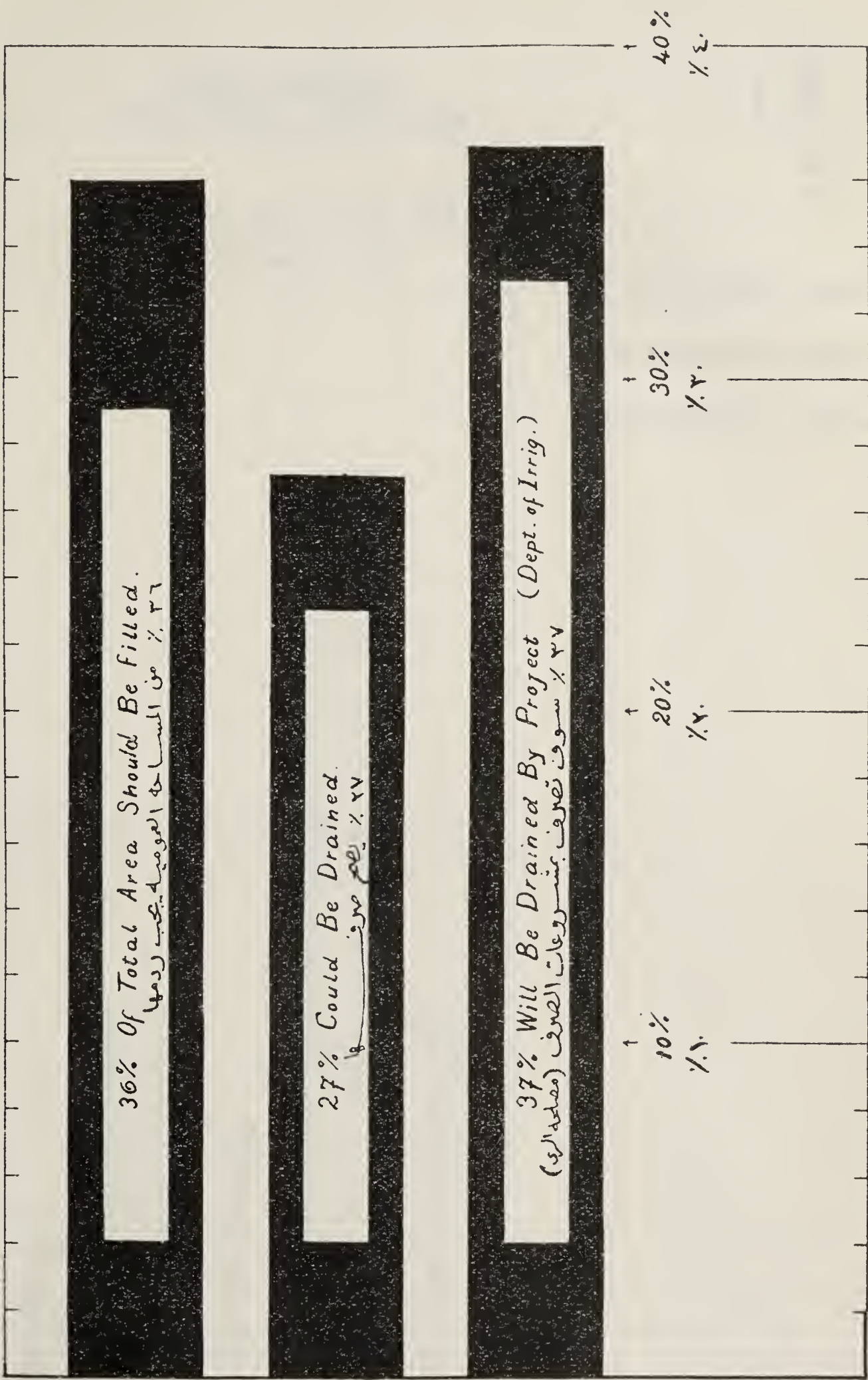
T. S. Mansour





طرق المقاومة الدائمة

Methods of Permanent Control.



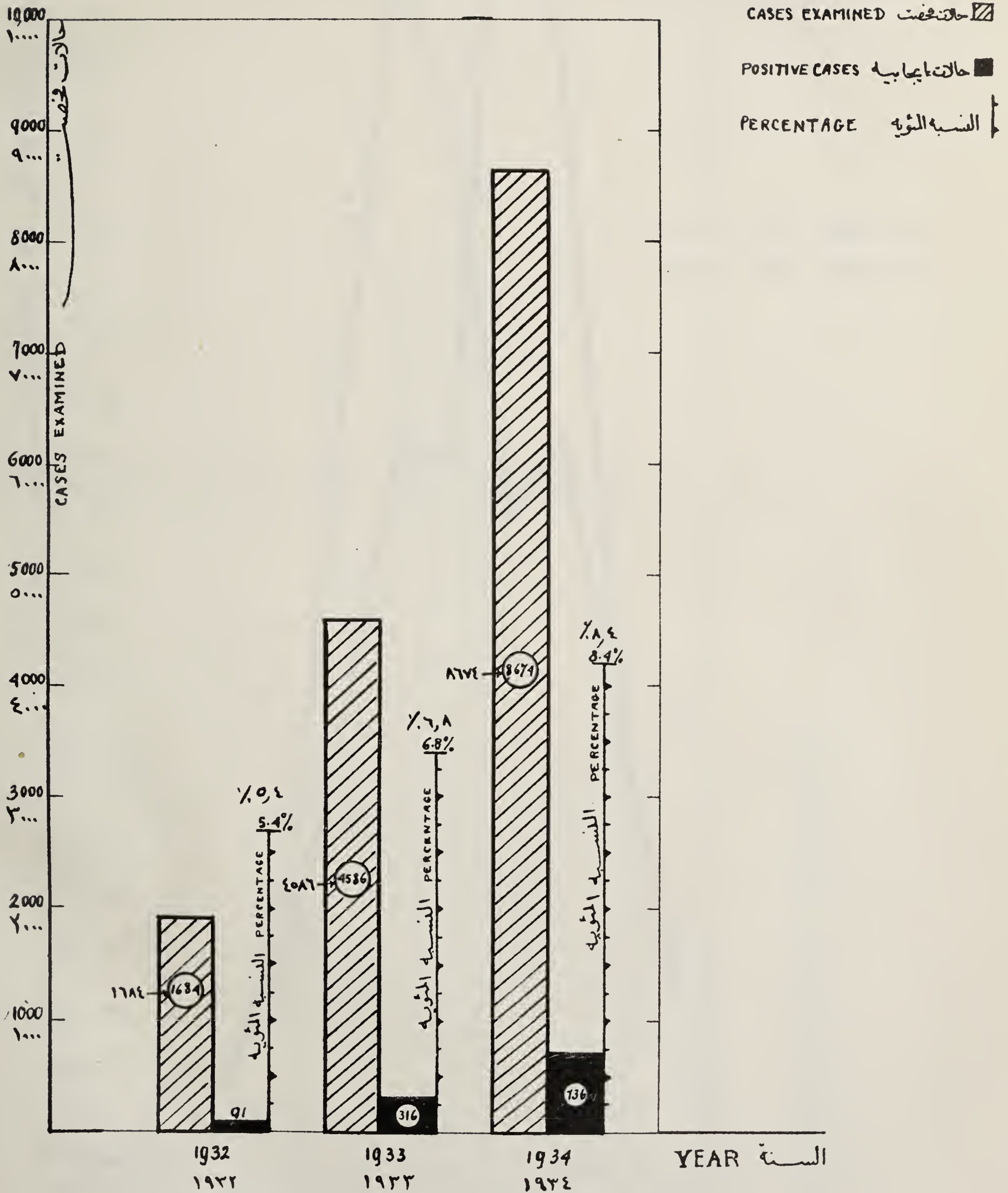




CASES EXAMINED  
FOR THE YEARS 1932, 33, & 1934

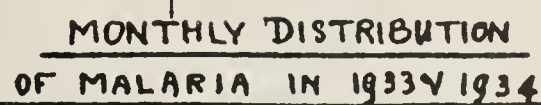
8  
٨

المحالات التي فحصت للسنوات  
١٩٣٤ ، ١٩٣٣ ، ١٩٣٢









التوزيع الشهري للملايين  
في سنتي ١٩٣٣ و ١٩٢٤

1922-1933

1928 - 1934





# MONTHLY DISTRIBUTION OF MALARIA CASES

توزيع حالات الملاريا على شهور السنة

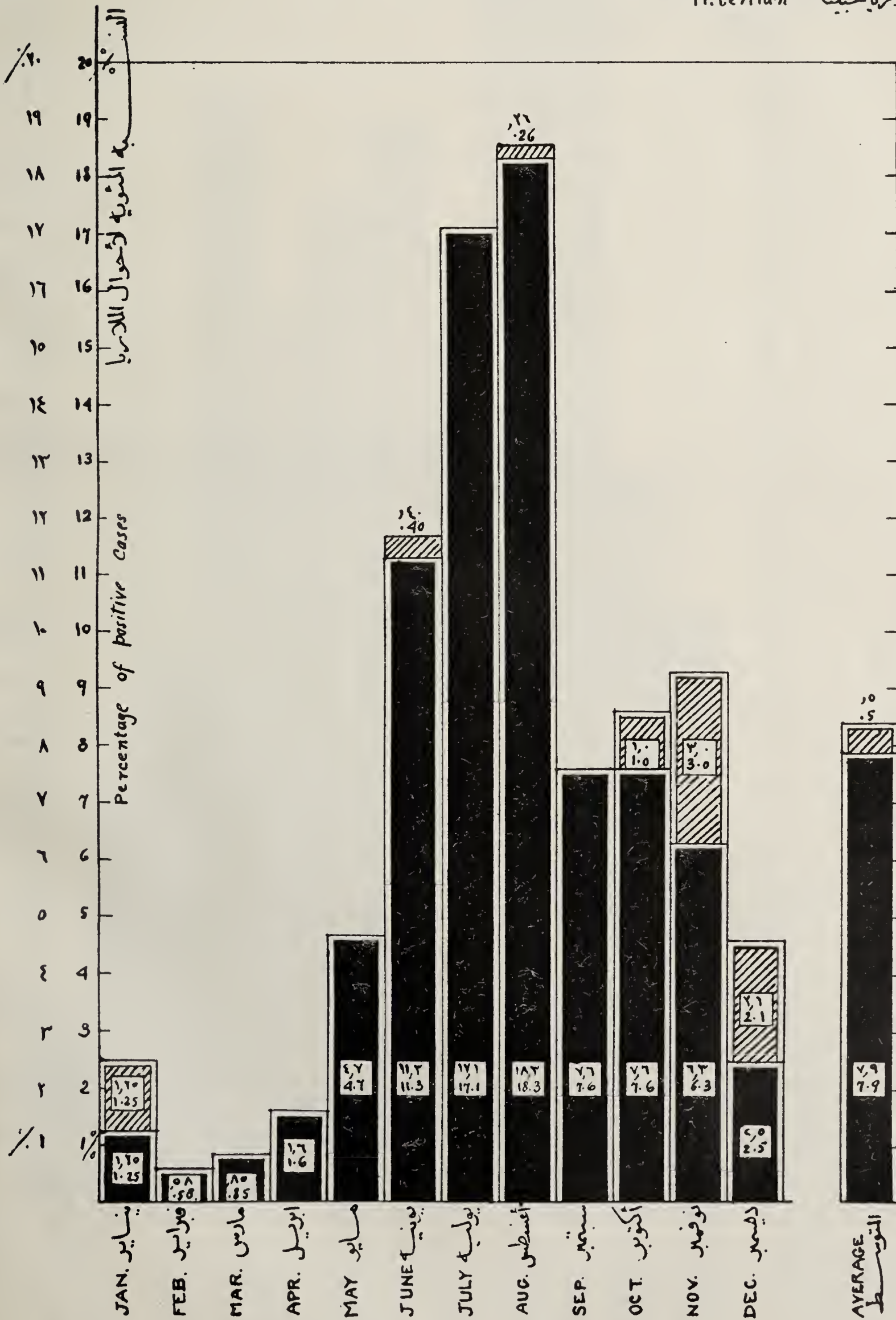
1934 — 1935

10

10

B. tertian ثلاثية حميدة ■

M. tertian ملاريا خبيثة ▨





THE UNIVERSITY OF CHICAGO  
LIBRARY

1911

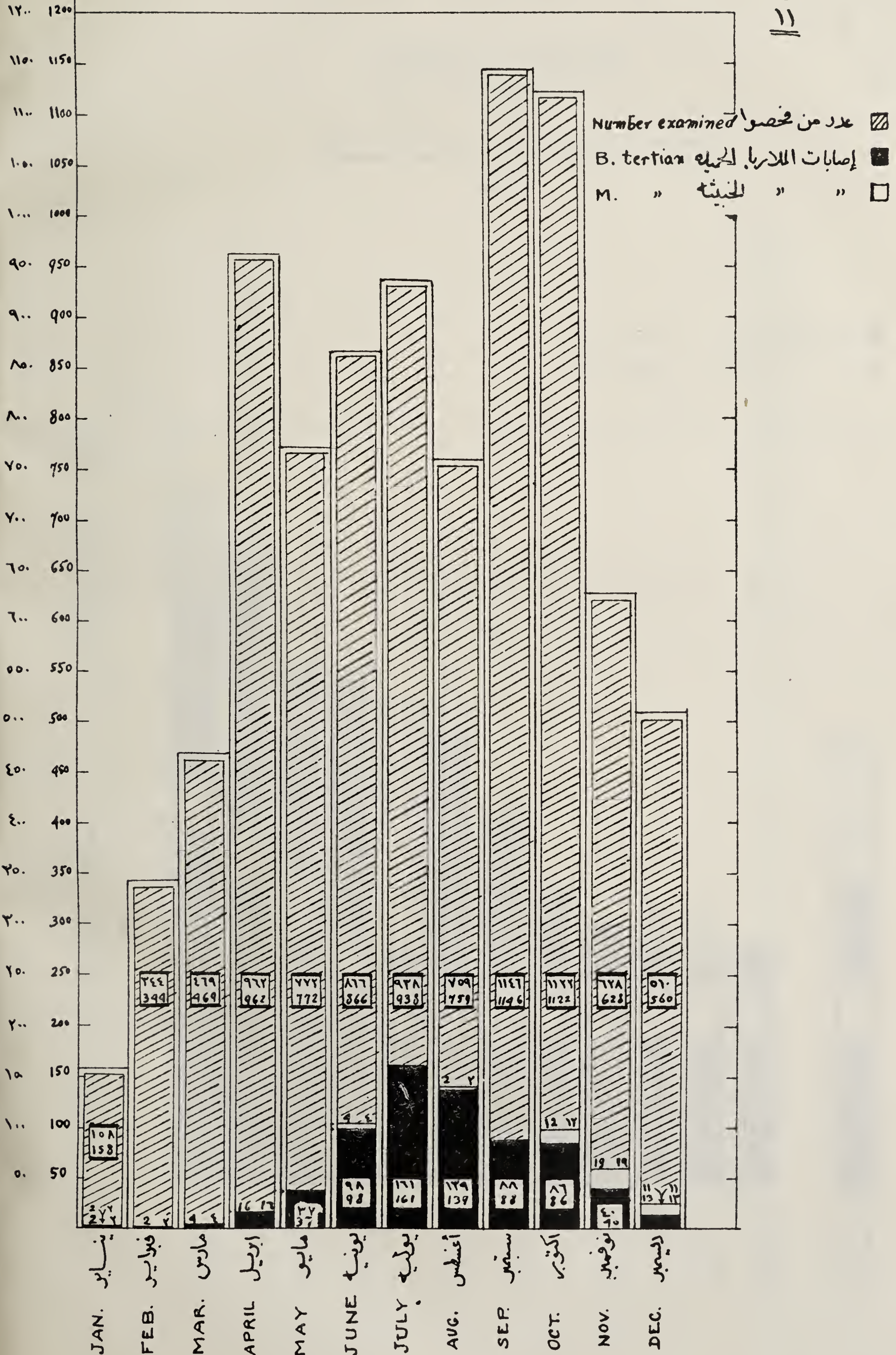
No.	Author	Title	Date	Remarks
1	...	...	...	...
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97	...	...	...	...
98	...	...	...	...
99	...	...	...	...
100	...	...	...	...

MONTHLY DISTRIBUTION OF MALARIA CASES  
AMONG PATIENTS EXAMINED

توزيع حالات الملاريا على أشهر السنة وعدد من فحصوا

11

11



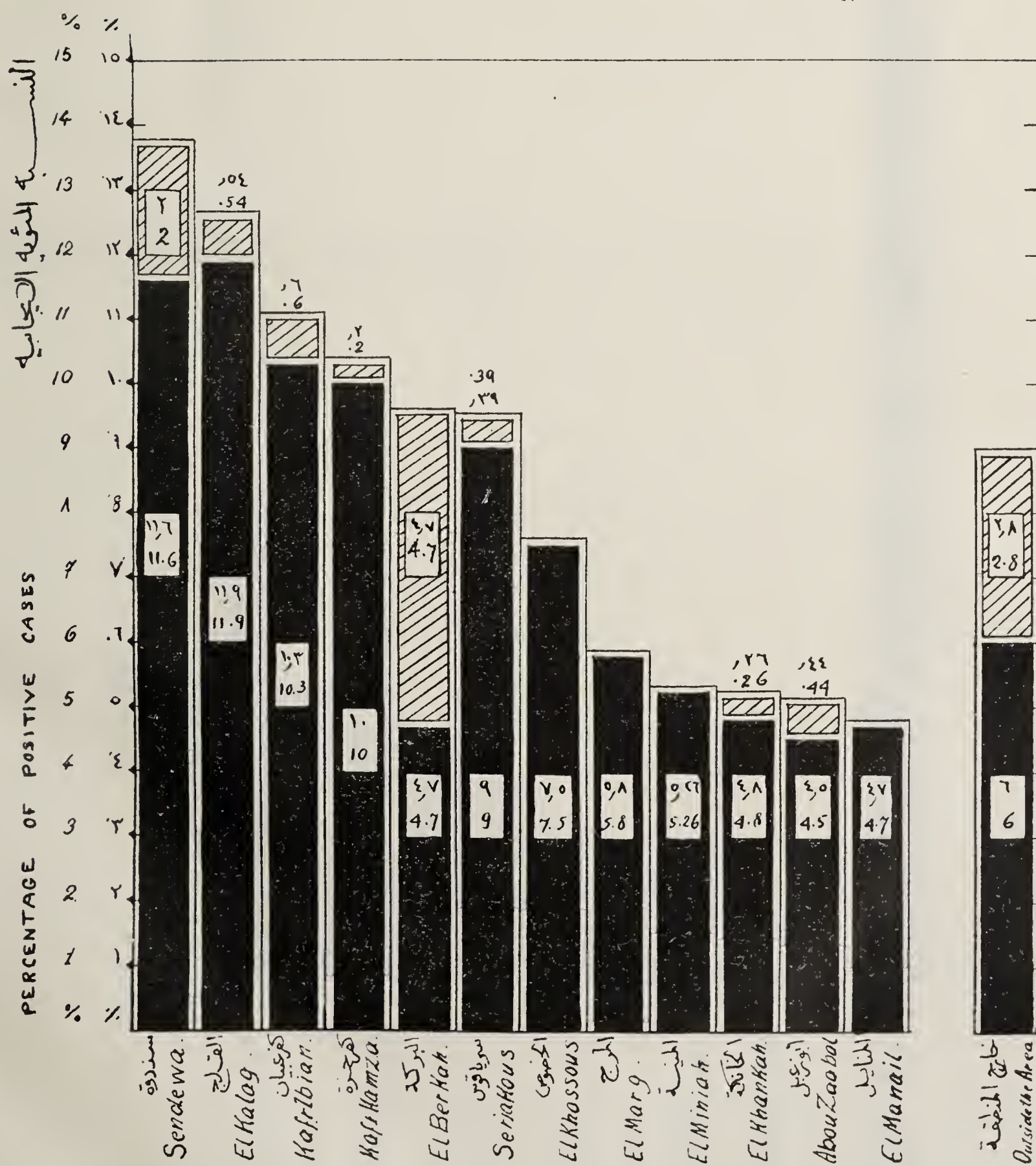




حالات الملاريا موزعة على البلدان  
١٩٣٤

*Malaria Cases Distributed on Towns*  
1934.

B.tertian. احبات الملاريا الحمية ■  
M.tertian. الحبيثة " " ▨



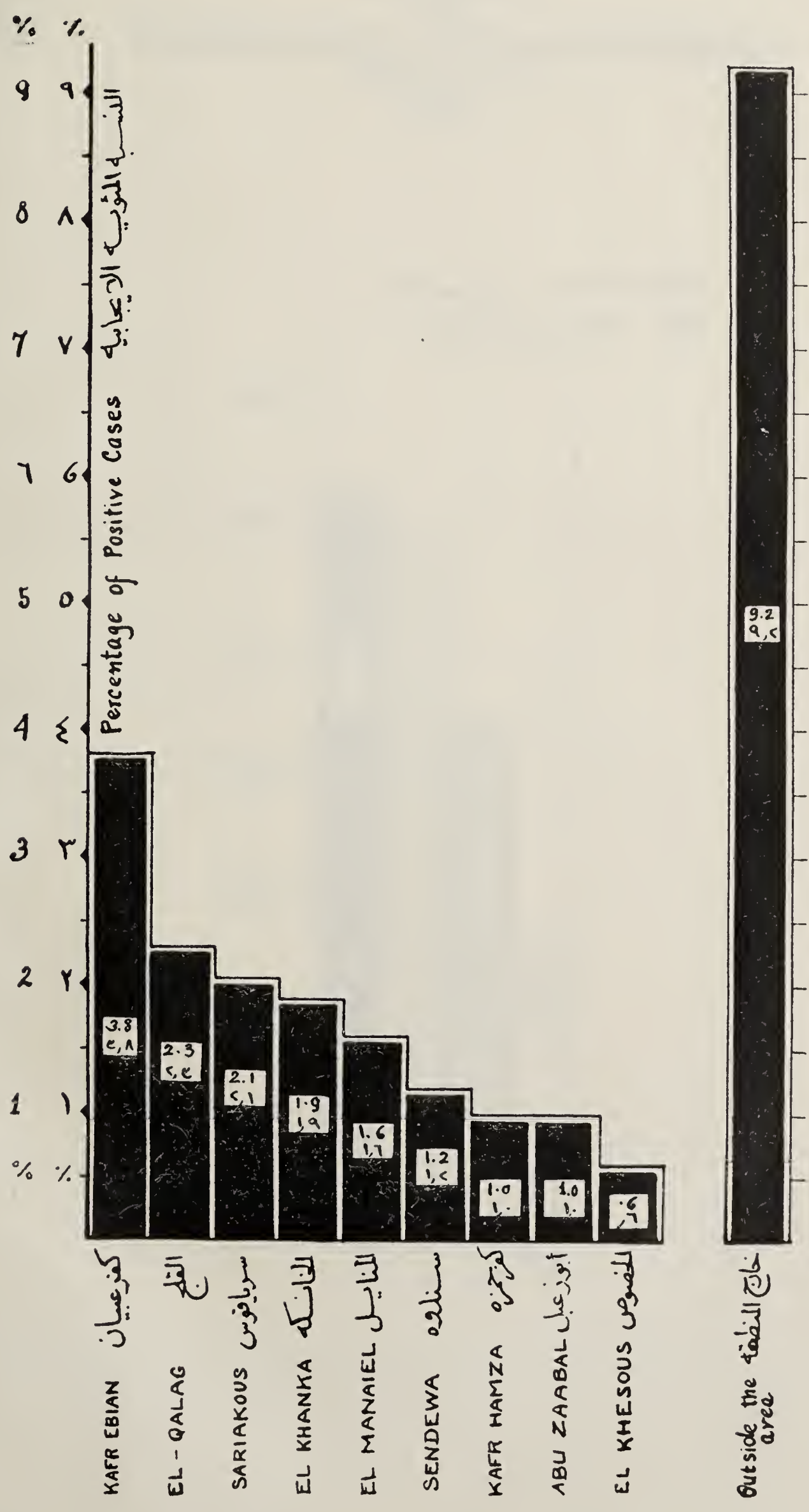




نسبة إصابات الفيلاريا موزعة على بلدان المنطقة

PERCENTAGE OF FILARIA IN THE VILLAGES OF THE AREA

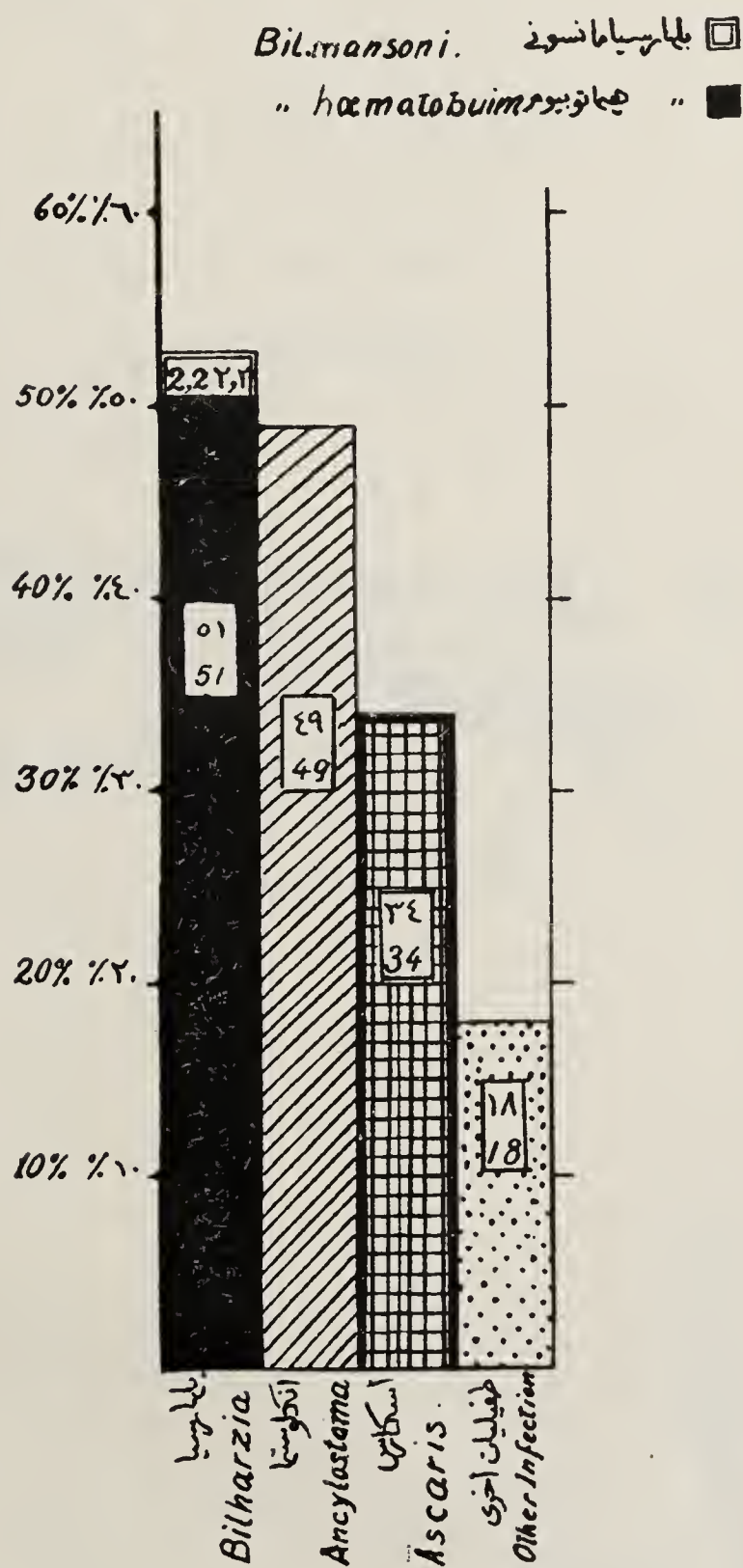
1934 — 19٣٤







Percentage infection of Bilharzia, Ancylostoma, &  
Ascaris., etc...  
1934.







# انواع البعوض في ابو صوير والاسماعيلية Mosquito Survey at Abou Souer & Ismailiah.

Note:

- |   |                                 |                        |
|---|---------------------------------|------------------------|
| ★ | <i>Anopheles mauritianus.</i>   | أنوفيلي موريتياني      |
| ● | " <i>pharoensis.</i>            | " فريونين              |
| ◐ | " <i>multicolor.</i>            | " ملتيكولر             |
| ▲ | " <i>sergenti.</i>              | " سرجنتاي              |
| ▮ | <i>Theobaldia longiareolata</i> | ثيوبولديا لونجيارولاتا |
| ▯ | <i>Uranotaenia unguiculata</i>  | يورنوتينيا يونجيكولاتا |
| ◻ | <i>Aedes caspius.</i>           | أيدس كاسبس             |
| ◻ | " <i>ægypti.</i>                | " ايجبتي               |
| Ⓢ | <i>Culex pusillus.</i>          | كولكس بيوسيلاس         |
| Ⓛ | " <i>laticinctus</i>            | " لاتيسنكتاس           |
| Ⓚ | " <i>quasigelidus</i>           | " كوايسجيليدس          |
| Ⓟ | " <i>perexiguus.</i>            | " بركسيجواس            |
| Ⓛ | " <i>laurenti.</i>              | " لورنتاي              |
| Ⓟ | " <i>pipiens.</i>               | " ببيانز               |



Scale  
مقياس الرسم  
0 1 2 3 4 5 6 7 8 9 10 Km.





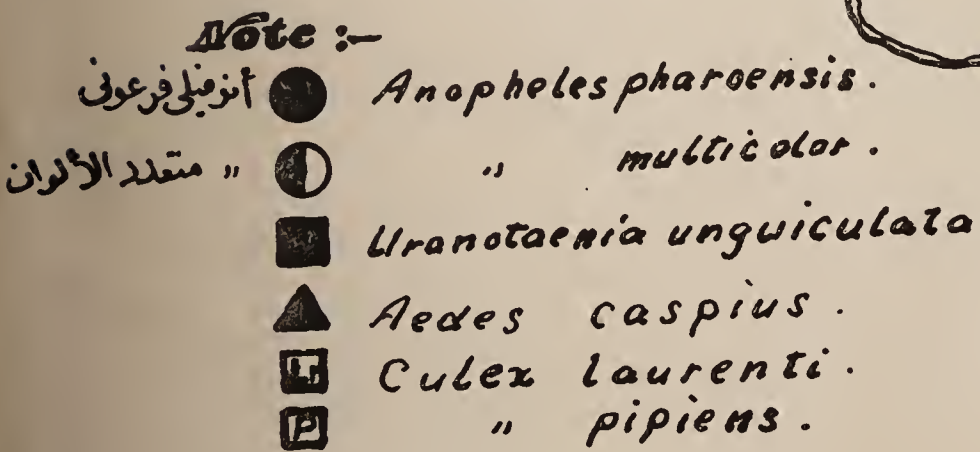
أنواع البعوض في الاسكندرية وضواحيها

2

Y

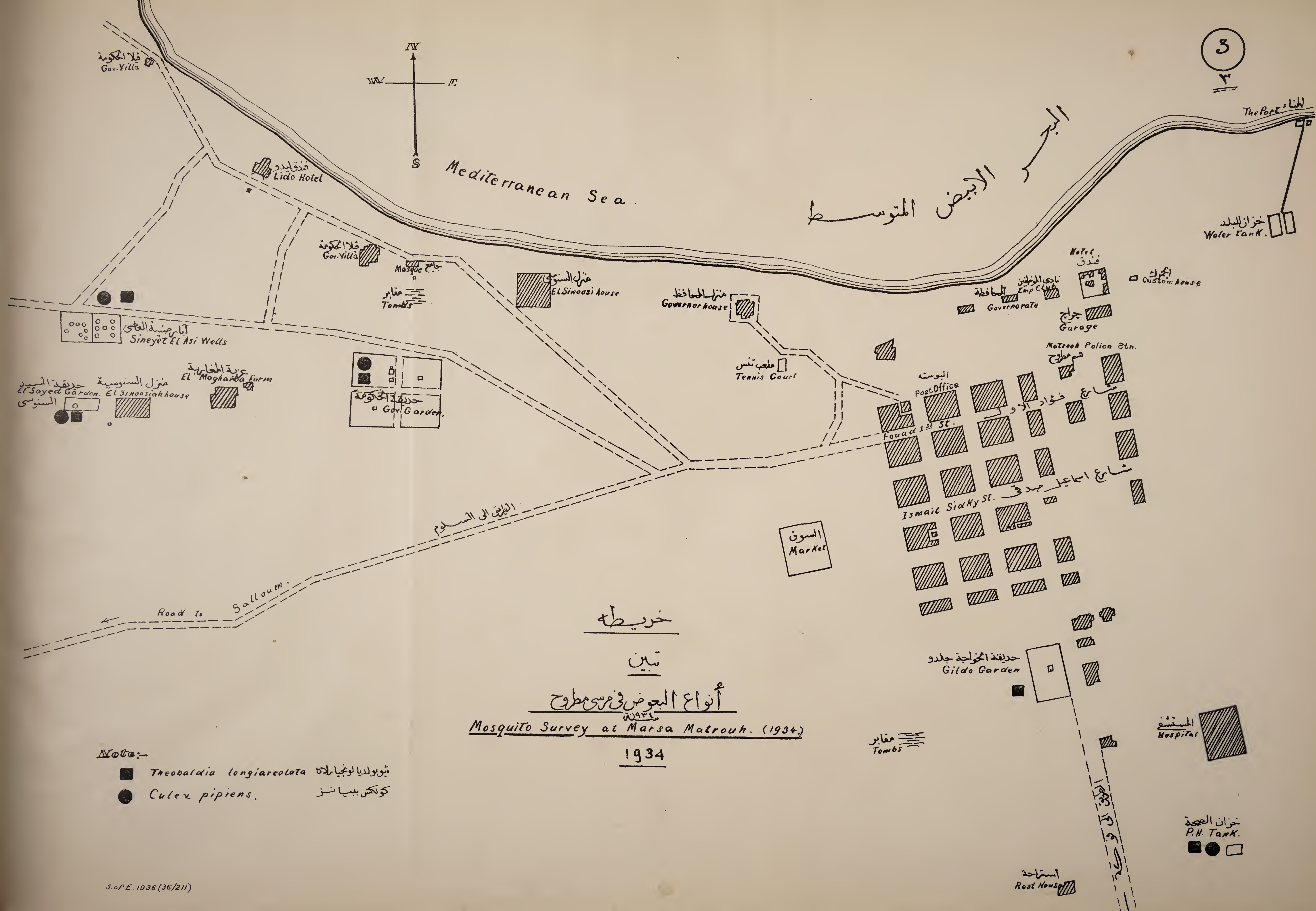
الحرس الأبيض المتوسط

Mediterranean Sea





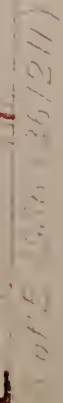












三

وتحذيد المظففة  
تقصر وتوزع

# DISTRIBUTION OF BIRKAS IN THE AREA

REFERENCE

Birka numbered 05 البرك بأرقامها

انظر خريطة (٦) للاصطلاحات الأخرى  
[See Map (6) for other references.]

1942

4361

Scale  
مقیاس

Ms 1000 0 1 2 3 km

مستطوي مساحة المثلث (٢٦) : (١١) سنة ١٩٣٦







# خريطة بأنواع بيرقات البعوض في المنطقة MOSQUITO SURVEY IN THE AREA

## NOTE

- ★ *Anopheles mauritanus*.
- " *pharoensis*.
- " *multicolor*.
- *Theobaldia longiareolata*.
- ▣ *Uranotaenia unguiculata*.
- ▲ *Aedes caspius*.
- Ⓟ *Culex pusillus*.
- Ⓛ " *laticinctus*.
- Ⓞ " *quasigelidus*.
- Ⓣ " *tipuliformis*.
- Ⓟ " *perexiguus*.
- Ⓛ " *Laurenti*.
- Ⓟ " *pipiens*.



سنة ١٩٣٤  
1934

مقياس الرسم Scale











الخريطة تبين  
مشروع  
إنشاء طلبية لصرف منطقة البركة وإنشاء مصرف  
البركة والخصوص وامتداد مصرف بليس والجبل الأصفر

# A DRAINAGE SCHEME (D. O. I.)

اصطلاحات

- حدود المنطقة  
المساحة المنظور تصفيفها  
المرور  
مصارف مقترحة  
الكلك الحديثة  
الطرق الرئيسية  
الترع والمصارف

## REFERENCE

- Canals & drains.....  
Main roads.....  
Railways.....  
Proposed drains.....  
Birkas.....  
Area served.....  
Limits of the area.....

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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## NOTE

النسبة المئوية لإصابات الملايا  
 داخل الدائرة النسبة المئوية للملايا  
 خارج الدائرة النسبة المئوية للملايا

*Anopheles mauritianus*.  
 " *pharoensis*.  
 " *multicolor*

1942 1934

مفتی محمد رفیع الرحمن

(17-11) 297-298









